GROUNDFISH RESOURCES OF THE ALEUTIAN ISLANDS:
COOPERATIVE 1983 U.S.-JAPAN BOTTOM
TRAWL SURVEY

by

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ABSTRACT

The results of the 1983 resource assessment survey of groundfish stocks in the Aleutian Islands region is presented. During July-November 1983, two NOAA research vessels used by the Northwest and Alaska Fisheries Center of the National Marine Fisheries Service (NMFS) and a large Japanese stern trawler chartered by the Japan Fisheries Agency (JFA) successfully completed sampling 377 demersal trawl stations. Species encountered in highest abundance include walleye pollock (*Theragra chalcogramma*); giant grenadier (*Albatrossia pectoralis*); Pacific ocean perch (*Sebastes alutus*); Pacific cod (*Gadus macrocephalus*); and Atka mackerel (*Pleurogrammus monopterygius.*). Information on the principal species occurring in the catches includes catch rates, biomass estimates, distribution and abundance, and size composition. Individual trawl station locations by vessel are also presented.

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CONTENTS

INTRODUCTION

The Northwest and Alaska Fisheries Center of the U.S. National Marine Fisheries Service, and the Far Seas Fisheries Research Laboratory of the Fisheries Agency of Japan (JFA) conducted the second comprehensive resource assessment survey of the Aleutian Islands during July-November 1983. Two NOAA research vessels, the *Miller Freeman* and the *Chapman*, and a Japanese stern trawler, the *Datio Maru No. 38,* used otter trawls to survey the demersal fish and invertebrate resources found on the continental shelf and upper slope from Stalemate Bank west of Attu Island to Unimak Pass including Bowers Ridge (Fig. 1).

The primary objectives of the survey were to collect data on the biological parameters of the principal groundfish and invertebrate species encountered during the survey and to monitor their change with time. These include estimates of the distribution and relative abundance, growth and length-weight relationships, and the size-sex-age composition by species. Appendices to this report contain length-weight relationships for 11 principal species and surface and bottom water temperatures collected by station.

The Aleutian Islands waters contain productive fishing grounds and have historically supported fisheries for Pacific cod (*Gadus macrocephalus*), walleye pollock (*Theragra chalcogramma*), Atka mackerel (*Pleurogrammus monopterygius*), rockfish (*Sebastes spp.*), sablefish (*Anoplopoma fimbria*), and flatfishes (Pleuronectidae) by foreign nations (Table 1). For the time period 1977-83, walleye pollock was the most important component of the Aleutian Islands fisheries resource, with population removals primarily from the southern Bering Sea subarea. Landings of Atka mackerel and rockfishes of the Pacific ocean perch complex were taken mostly from the western portion of the survey area; whereas Pacific cod and other flounder catches occurred

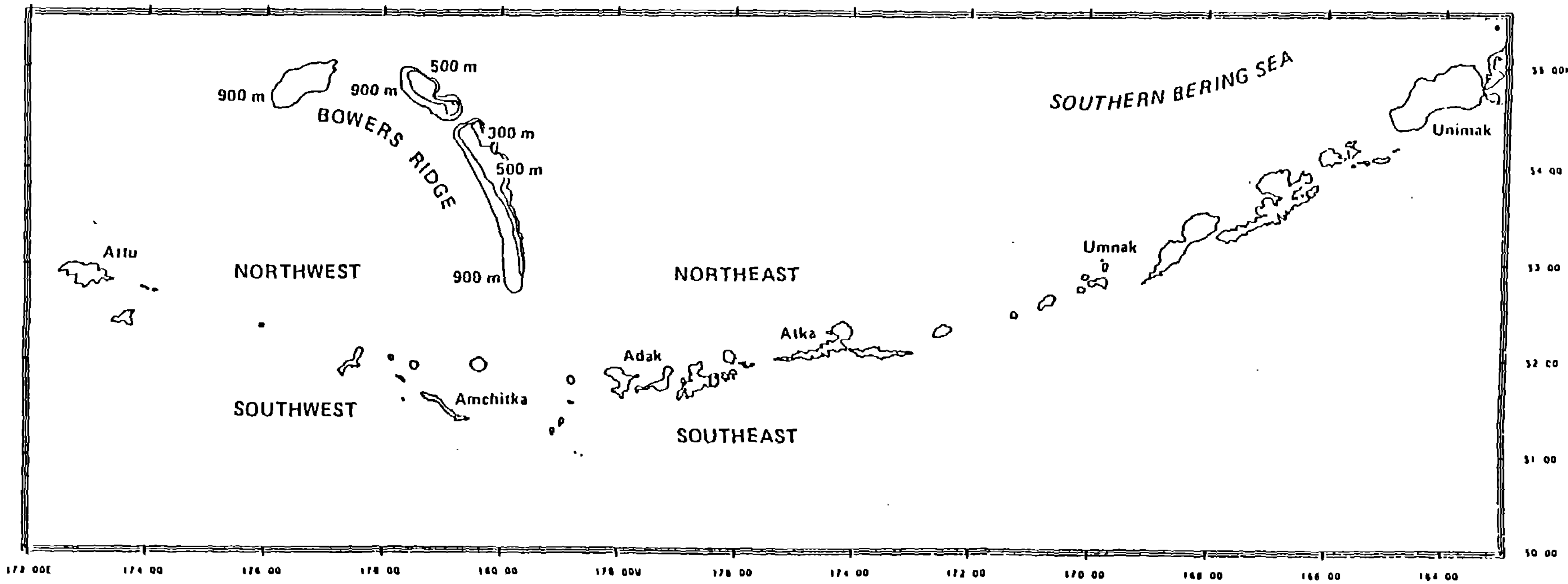

Figure 1. --Survey area during the 1983 cooperative U.S. -Japan Aleutian Islands survey.

Table 1.--Foreign reported groundfish catch (x 100 t) by Aleutian Islands subareas for the years 1977-83.

Year	Walleye pollock	Pacific Cod	Yellowfin sole	Other flounders	POP complex	Atka mackerel	Total
Bering Sea[a/]							
Southern							
1977	714	29	13	26	3	0	785
1978	580	24	4	28	8	3	647
1979	660	27	9	47	9	10	762
1980	641	37	6	38	1	32	755
1981	775	47	7	54	5	14	902
1982	845	25	0	42	1	3	916
1983	748	26	2	46	1	4	827
Aleutian region[b/]							
Northeast							
1977	27	9	19	0	25	28	108
1978	16	3	35	0	15	67	136
1979	17	11	60	0	26	19	133
1980	122	2	35	0	6	11	176
1981	99	0	0	20	5	6	130
1982	60	8	0	17	0	2	87
1983	49	9	0	7	0	0	65
Southeast							
1977	7	4	0	3	28	0	42
1978	16	8	0	21	32	26	103
1979	25	14	1	19	43	75	177
1980	206	10	0	24	23	133	396
1981	169	5	0	16	15	98	303
1982	207	9	0	14	7	49	286
1983	75	0	0	5	4	6	90
Northwest							
1977	10	1	0	6	13	32	62
1978	4	0	0	8	4	11	27
1979	11	4	0	33	26	1	75
1980	52	1	0	5	5	0	63
1981	51	0	0	8	1	1	61
1982	52	0	0	14	3	0	69
1983	23	0	0	19	2	0	44
Southwest							
1977	22	4	0	14	58	150	248
1978	16	2	0	19	40	117	194
1979	30	9	0	42	57	109	247
1980	172	6	2	14	23	1	218
1981	129	4	0	20	13	16	182
1982	117	0	0	18	5	0	140
1983	74	4	0	13	0	0	91
Bowers Ridge							
1977	1	0	0	0	0	0	1
1978	0	0	0	3	6	0	9
1979	0	0	0	2	3	0	5
1980	18	0	0	0	4	0	22
1981	15	0	0	0	1	0	14
1982	18	0	0	3	0	0	21
1983	9	0	0	0	0	1	10
Aleutian total	1,919	127	152	387	493	959	4,037
Total Survey Area	6,882	342	193	668	521	1,025	9,631

a/ International North Pacific Fisheries Commission (INPFC) Area 1.
b/ INPFC Area 2.

throughout the Aleutian Islands. The Pacific ocean perch complex consists of ocean perch (Sebastes alutus), shortraker rockfish (Sebastes borealis), rougheye rockfish (Sebastes aleutianus), sharpchin rockfish (Sebastes zacentrus), and redstripe rockfish (Sebastes proriger).

METHODS

Sampling strategy

The total survey area extended over two International North Pacific Fisheries Commission (INPFC) statistical areas: the southern portion of the eastern Bering Sea area (INPFC 51) and the Aleutian Islands area (INPFC 54) including Bowers Ridge. Survey data were analyzed and presented by these two distinct areas with the Aleutian Islands further divided into five subareas (northwest, southwest, northeast, southeast, and Bowers Ridge) as shown in Figure 1.

During the initial 1980 Aleutian Islands survey, the primary sampling objective was to assure a wide geographic and bathymetric coverage of the survey area. To accomplish this the continental shelf and upper slope, both north and south of the Aleutian Islands from Stalemate Bank to the Islands of Four Mountains and the north side of the island chain from Umnak Island to Unimak Pass, were divided into sampling units one degree of longitude wide (Wilderbuer 1985). Each sampling unit was further divided into five depth intervals:

l-100 m (l-54 fathoms)
101-200 m (55-108 fathoms)
201-300 m (109-162 fathoms)
301-500 m (163-273 fathoms)
501-900 m (274-492 fathoms).

At least one trawl station was assigned to each depth interval of each longitudinal sampling section. For depth intervals over 5 nautical miles wide additional sampling was apportioned. Sampling effort and station location in the Bowers Ridge subarea was similarly defined.

The 1983 sampling plan was developed based upon the distribution and abundance of the principal species as determined by the 1980 Aleutian Islands survey to improve the precision of the survey biomass estimates. This was accomplished by stratifying the region into substrata based upon the abundance of the principal species encountered during the initial 1980 cooperative survey, and sampling densities were allocated based upon the variance of the abundance estimates. These sampling densities were then apportioned into the same longitudinal and depth sampling units used in 1980.

Survey Period and Vessels

The survey period extended from July to November with the most extensive coverage of the survey area being performed by the Daito Maru No. 38, which completed 263 stations in two legs. The first leg occurred from 9 July to 5 September with the vessel sampling the south side of the Aleutian Islands from Attu Island to Seguam Pass, and also the north side from Great Sitkin Island to Unalaska Island. For the second leg, the vessel returned to the survey area on 23 September and sampled the south side of the island chain from Kiska Island to Stalemate Bank including Bowers Ridge.

Two NOAA ships participated in the survey, the Miller Freeman and the Chapman. From 26 July to 14 August the Miller Freeman completed 99 demersal trawl stations sampling the central Aleutian region from Kiska Island to Atka Island. The Chapman, with a more limited participation, completed 63 stations from 16 August to 5 September sampling the southern Bering Sea and northeastern Aleutian subareas. Participating scientists in the survey are listed in Table 2.

Table 2.--Scientific personnel participating in the cooperative U.S.-Japan 1983 Aleutian Island resource assessment survey.

Vessel	Date	Personnel
Miller Freeman	July 26 to August 14	Lael Ronholt, NWAFC[a], Chief Scientist
		Ronald Payne, NWAFC, Biological Technician
		Robert Loghry, NWAFC, Biological Technician
		Sarah Hinckley, NWAFC, Fisheries Biologist
		Renold Narita, NWAFC, Fisheries Biologist
		Lana Ong, SI[b], Museum Technician
		James Long, NWAFC, Fisheries Biologist
		James Smart, NWAFC, Net Mender
Chapman	August 16 to September 5	Harold Zenger, NWAFC, Chief Scientist
		James Long, NWAFC, Fisheries Biologist
		David King, NWAFC, Fish. Gear Main (Ldr.)
		Jeff Polvony, NPFMC[c], Fisheries Biologist
Daito Maru No. 38	July 16 to August 8	Kazuyuki Teshima, FSFRL[d], Chief Scientist
		Herbert Shippen, NWAFC, Fisheries Biologist
		Yano Toshihiko, Tokyo U.[e], Research Assist.
	August 8 to August 29	Kazuyuki Teshima, FSFRL, Chief Scientist
		Thomas Wilderbuer, NWAFC, Fisheries Biologist
		Yano Toshihiko, Tokyo U., Research Assist.
	September 23 to October 12	Kiyoshi Wakabayashi, FSFRL, Chief Scientist
		Eric Brown, NWAFC, Fisheries Biologist
		Yano Toshihiko, Tokyo U., Research Assist.
	October 13 to November 4	Kiyoshi Wakabayashi, FSFRL, Chief Scientist
		Harold Zenger, NWAFC, Fisheries Biologist
		Yano Toshihiko, Tokyo U., Research Assist.

a/ NWAFC - Northwest and Alaska Fisheries Center, Seattle, WA, USA.

b/ SI - Smithsonian Institution, Washington, D.C., USA.

c/ NPFMC - North Pacific Fisheries Management Council, Anchorage, AK, USA.

d/ FSFRL - Far Seas Fisheries Research Laboratory, Shimizu, Japan.

e/ Tokyo U. - Tokyo University of Fisheries, Tokyo, Japan.

The NOAA ship _Miller Freeman_ is a 65.5-m stern trawler powered by a single 2,150-hp main engine, and the NOAA ship _Chapman_ is a 38.5-m stern trawler driven by a 1,150-hp main engine. The _Daito Maru No. 38_ is a land-based Hokuten stern trawler 51.8 m in length and powered by a 3,800-hp main engine. All three vessels are well equipped for bottom trawling, fish finding, and navigation.

Gear

All bottom trawling by the U.S. research vessels was conducted with a Noreastern trawl (27.4 by 32 m) with roller gear (Fig. 2); the codend was lined with 1.5-inch stretched mesh nylon webbing. The headrope and footrope were 27.4 and 32 m long, respectively, with an effective trawling width of approximately 18 m. The Noreastern trawl was fished with 1.8- x 2.7-m steel v-type otter boards and triple 54.9-m dandylines.

A large Japanese commercial trawl was used by the _Daito Maru No. 38_ during the survey (Fig. 3). The headrope and footrope were 45 m and 58 m long, respectively, with a vertical opening of 5 m and a horizontal net opening of approximately 28 m. The trawl was equipped with roller gear constructed primarily of 53- and 35-cm gum bobbins and 30- and 41 -cm gum discs (Fig. 41, and it was fished with 80-m dandylines and 2.25- x 3.45-m otter boards weighing 2.4 t each in water.

Analysis

Mean catch per unit effort (CPUE) values are presented in kilograms per hour towed (kg/h) and were calculated for each species and subarea by weighting the mean CPUE values by the area of each strata.

Catch rates were standardized by trawl width and relative fishing power correction factors applied to species catch rates which varied between the

NOREASTERN

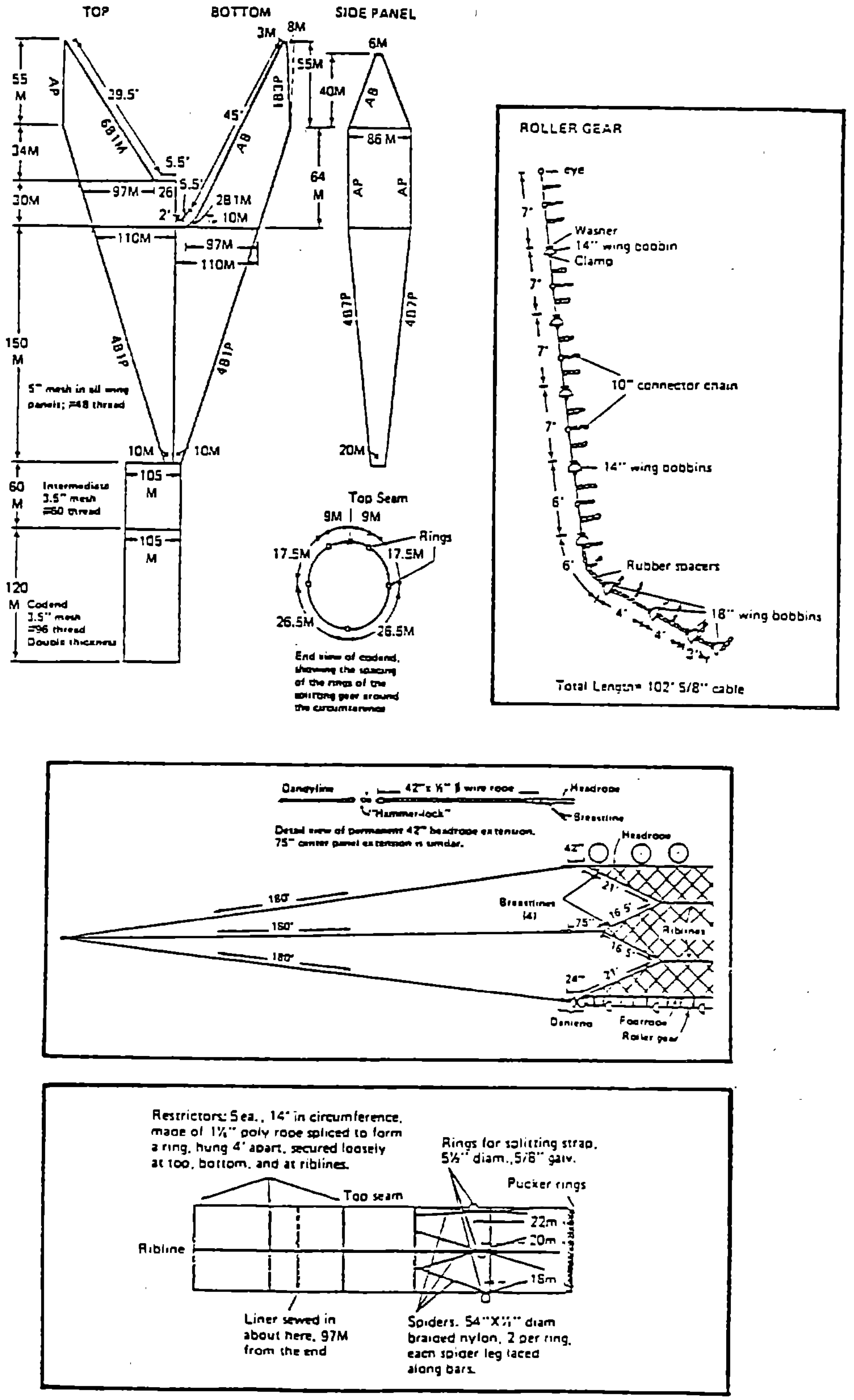

Figure 2.--Schematic diagram of the 27.4-m by 32-m Noreastern trawl used during the 1983 cooperative U.S.-Japan Aleutian Islands survey by the Hiller Freeman and the Chapman.

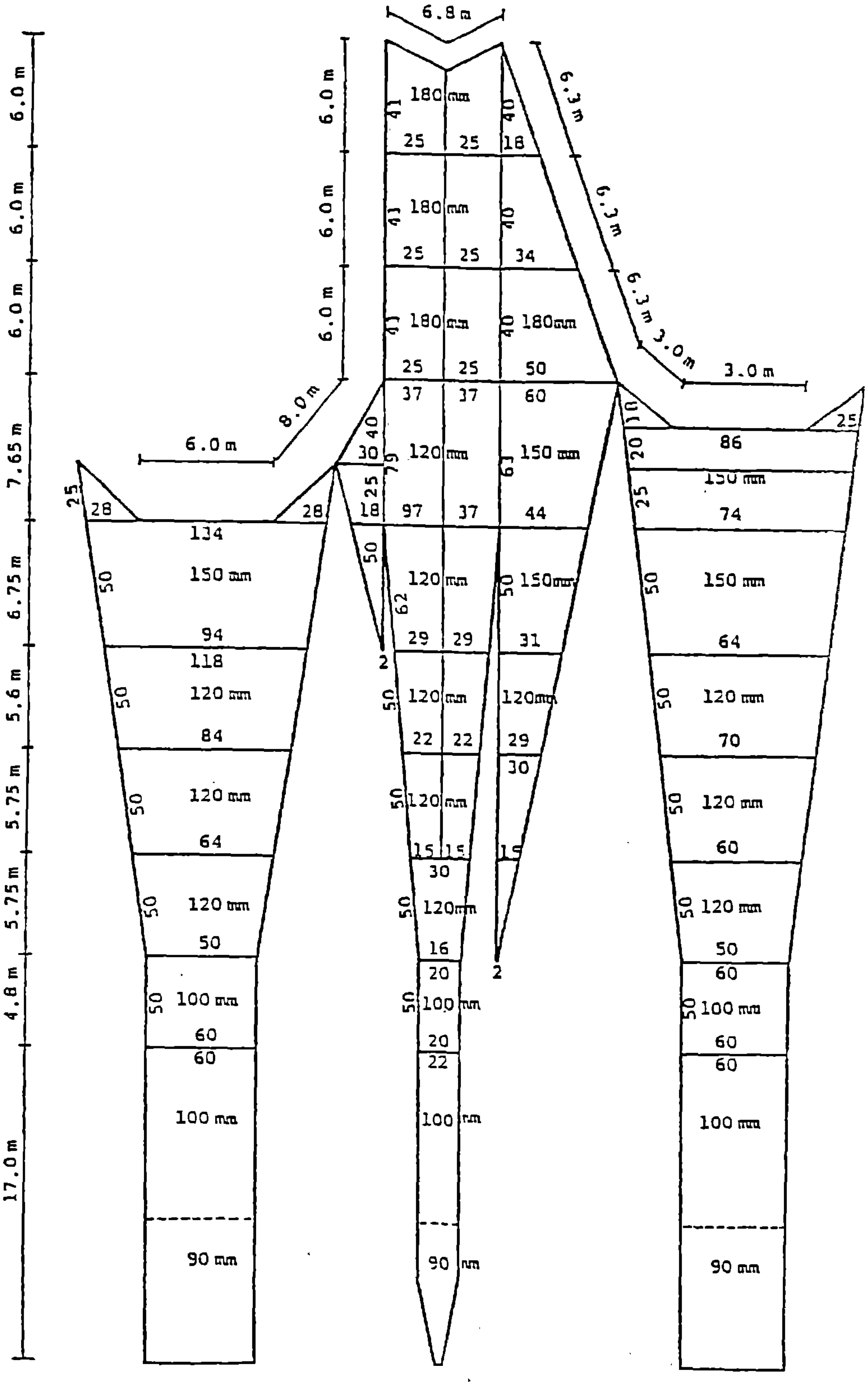

Figure 3.--Schematic diagram of the 45-m by 58-m Japanese commercial trawl used during the 1983 cooperative U.S.-Japan Aleutian Islands survey by the Daito Maru No. 38

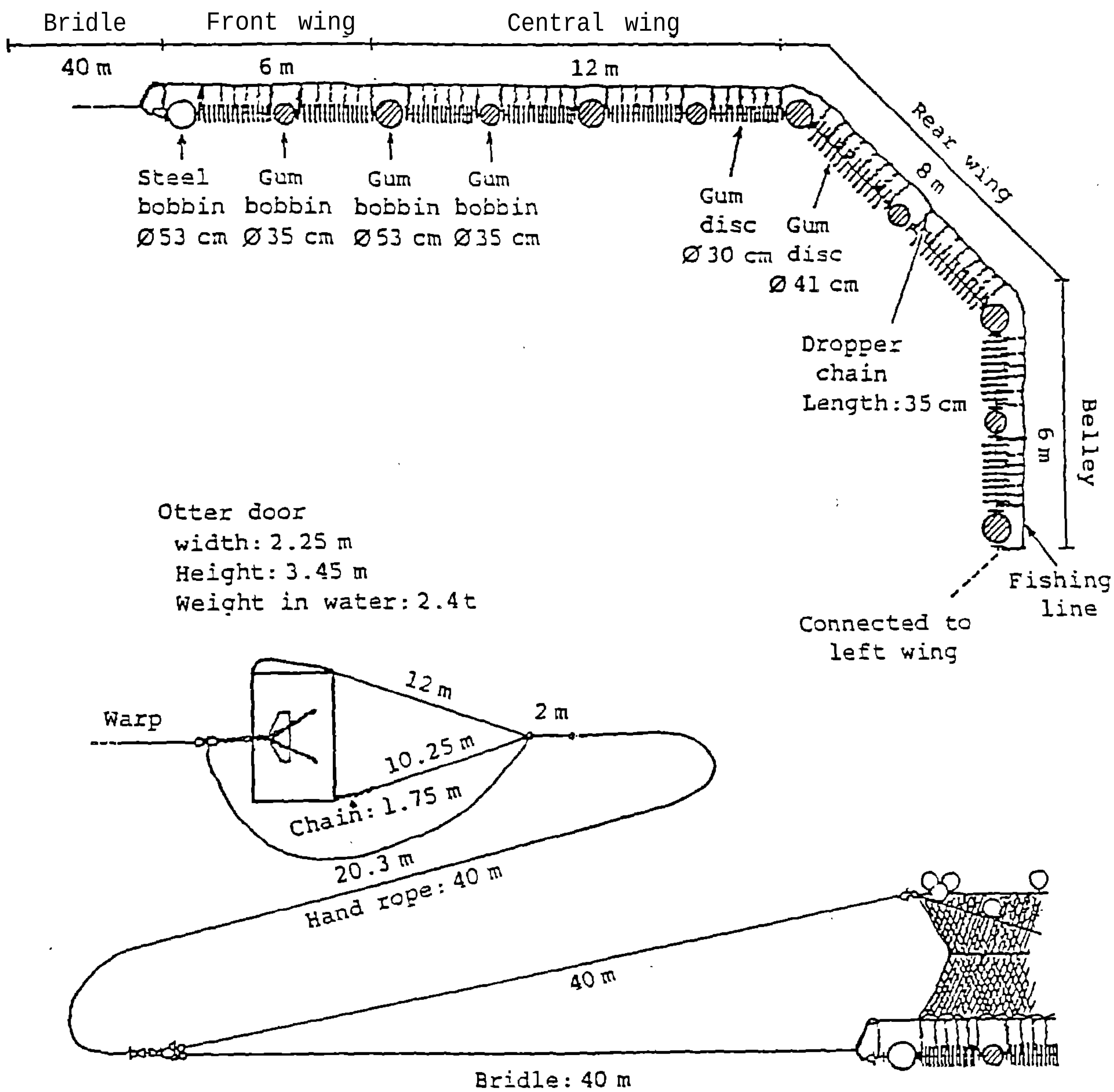

Figure 4. --Schematic diagram of the roller gear and dandyline used during the 1983 cooperative U.S.-Japan Aleutian Islands survey by the Daito Maru No. 38

U.S. Noreastern trawl and the Japanese commercial trawl. Fishing power coefficients were calculated by species from the ratio of the mean CPUE of the Miller Freeman and the Daito Maru No. 32 at 42 survey stations classified as comparative trawl hauls (Table 3). The criteria for classification as comparative hauls were stations conducted by both vessels in the same depth strata within the same or adjacent 30° longitudinal sampling area.

Biomass estimates were calculated using the area-swept technique (Alverson and Pereyra 1969) and utilized only successful demersal trawl catches which were standardized to the trawl most efficient at capturing each species. Biological data collected from the major species encountered during the survey are summarized in Table 4.

Length-weight measurements by sex were recorded from random samples of 11 species of importance occurring in abundance in the catches and are graphically presented in Appendix 1.

The precision of the biomass estimates for most of the species discussed in this report are given in Appendix 2 as sampling error.

RESULTS

During the survey, demersal trawl sampling was attempted at 425 stations: 263 by the Daito Maru No. 38, 99 by the Miller Freeman, and 63 by the Chapman. Of these, 377 stations were successfully completed (Table 5). The geographic and bathymetric distributions are shown in Figures 5-10.

In the Aleutian Islands area, the groundfish resources are dominated by six species: walleye pollock; giant grenadier *(Albatrossia pectoralis)*; Atka mackerel; Pacific ocean perch; Pacific cod; and sablefish, of which all except giant grenadier are commercially utilized (Table 6, Fig. 11). These six species account for 81% of the total mean catch rate of groundfish and a

Table 3. --Relative fishing powers of the *Miller Freeman* and the *Daito Maru No. 32* from 42 trawl stations classified as comparative hauls conducted during the 1983 cooperative U.S. -Japan Aleutian Islands survey.

Species[a/]	Number of stations at which species were caught		CPUE (kg/ha)		Ratio of CPUE[b/]
	Freeman	Daito	Freeman	Daito	Daito/Freeman
Walleye pollock (*Theragra chalcogramma*)	33	29	69.69	186.47	2.68[c/]
Pacific cod (*Gadus Macrocephalus*)	32	30	11.17	15.89	1.42
Sablefish (*Anoplopoma fimbria*)	17	22	2.06	3.29	1.60
Atka mackerel (*Pleurogrammus monoptergius*)	4	15	0.04	9.26	255.27
Rock sole (*Lepidopsetta bilineata*)	30	31	8.16	4.44	0.54[c/]
Arrowtooth flounder (*Atheresthes stomias*)	37	39	4.39	3.23	0.74
Greenland turbot (*Reinhardtius hippoglossoides*)	9	13	3.30	2.39	0.72
Pacific halibut (*Hippoglossus stenolepis*)	-18	28	2.50	1.71	0.68
Pacific ocean perch (*Sebastes alutus*)	26	32	8.36	13.21	1.58
Shortraker rockfish (*Sebastes borealis*)	8	11	1.58	1.61	1.02
Rougheye rockfish (*Sebastes aleutianus*)	11	17	0.83	0.67	0.81
Northern rockfish (*Sebastes polyspinis*)	23	23	0.56	1.48	2.67
Thornyheads (*Sebastolobus alascanus*)	14	15	0.57	0.93	1.62
Rex sole (*Glyptocephalys zachirus*)	12	16	0.25	0.07	0.28
Dover sole (*Microstomus pacificus*)	2	3	0.01	0.01	1.70
Flathead sole (*Hippoglossoides elassodon*)	13	8	0.33	0.01	0.03[c/]
Golden king crab (*Lithodes aequispina*)	14	14	3.06	0.11	0.04[c/]
Red squid (*Berryteuthis magister*)	20	23	0.17	1.43	8.27[c/]

a/ For species not listed, data was insufficient for meaningful comparisons.
b/ Calculated from CPUE (kg/ha) to six significant digits.
c/ Geisser and Eddy (1979) procedure indicated that populations sampled by each vessel were distinct and fishing power coefficients should be applied.

Table 4.--Number of length frequencies and age structures collected by Japanese and U.S. scientists during the 1983 cooperative Aleutian Islands groundfish resource assessment survey.

Species	Age structures		Length frequencies*	
	U.S.	Japan	U.S.	Japan
Arrowtooth Flounder	--	625	616	5,488
Greenland turbot	180	--	171	1,476
Flathead sole	216	49	468	750
Pacific halibut	--	--	544	593
Dover sole	--	--		47
Rex sole	28	--	70	776
Rock sole	500	1,426	3,929	8,105
Pollock	2,396	4,997	8,385	20,483
Pacific cod	1,592	--	3,609	7,335
Sablefish	217	--	347	4,170
Atka mackerel	145	602	338	7,205
Pacifc ocean perch	1,596	--	2,951	19,922
Northern rockfish	107	--	259	6,276
Shortraker rockfish	169	--	385	3,129
Rougheye rockfish	36	--	203	3,717
Shortspine thornyhead	25	--	38	6,613
Giant grenadier	--	--	594	5,691
Coryphaenoides cinereus	--	--	537	4,126
Berryteuthis magister	--	--	75	2,299
Total	7,207	7,699	23,519	108,201

* Lengths were measured from the anterior tip of the head to the end of the midcaudal rays (total or fork length) for fish except grenadiers, which were measured to the anus (anus length), and from the anterior tip to the posterior tip of the mantle (mantle length) for squids.

Table 5.--Number of successful trawl sampling stations by subarea, depth interval, and nation during the 1983 cooperative U.S.-Japan Aleutian Islands groundfish resource assessment survey.

		Depth zone (m)											
		1-100		101-200		201-300		301-500		501-900		Total	
Area	Subarea	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan	U.S.	Japan
Aleutian													
	Southwest	0	4	8	28	7	16	4	9	3	11	22	68
	Southeast	1	1	7	13	8	14	4	8	2	8	22	44
	Northwest	1	4	2	11	2	11	1	6	3	16	9	48
	Northeast	6	2	28	18	11	11	2	8	2	15	49	54
	Bowers Ridge	--	--	0	2	0	2	0	5	0	11	0	20
Bering Sea													
	Southern	11	2	10	4	4	4	0	3	0	3	25	16
	Total	19	13	55	76	32	58	11	39	10	64	127	250

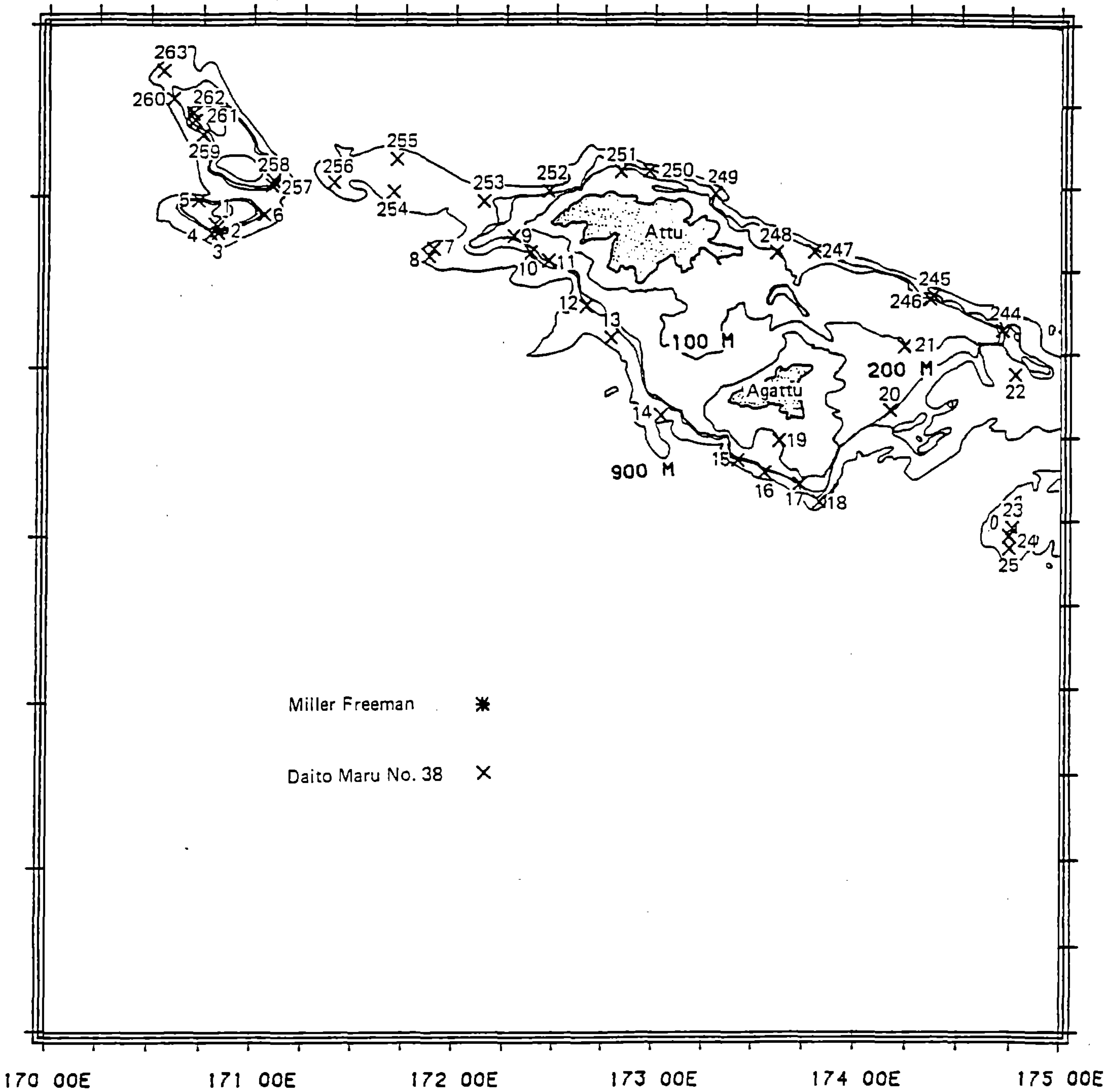

Figure 5.--Location of sampling stations, by vessel, completed from Stalemate Bank to Buldir Island during the 1983 cooperative U.S.-Japan Aleutian Islands trawl survey.

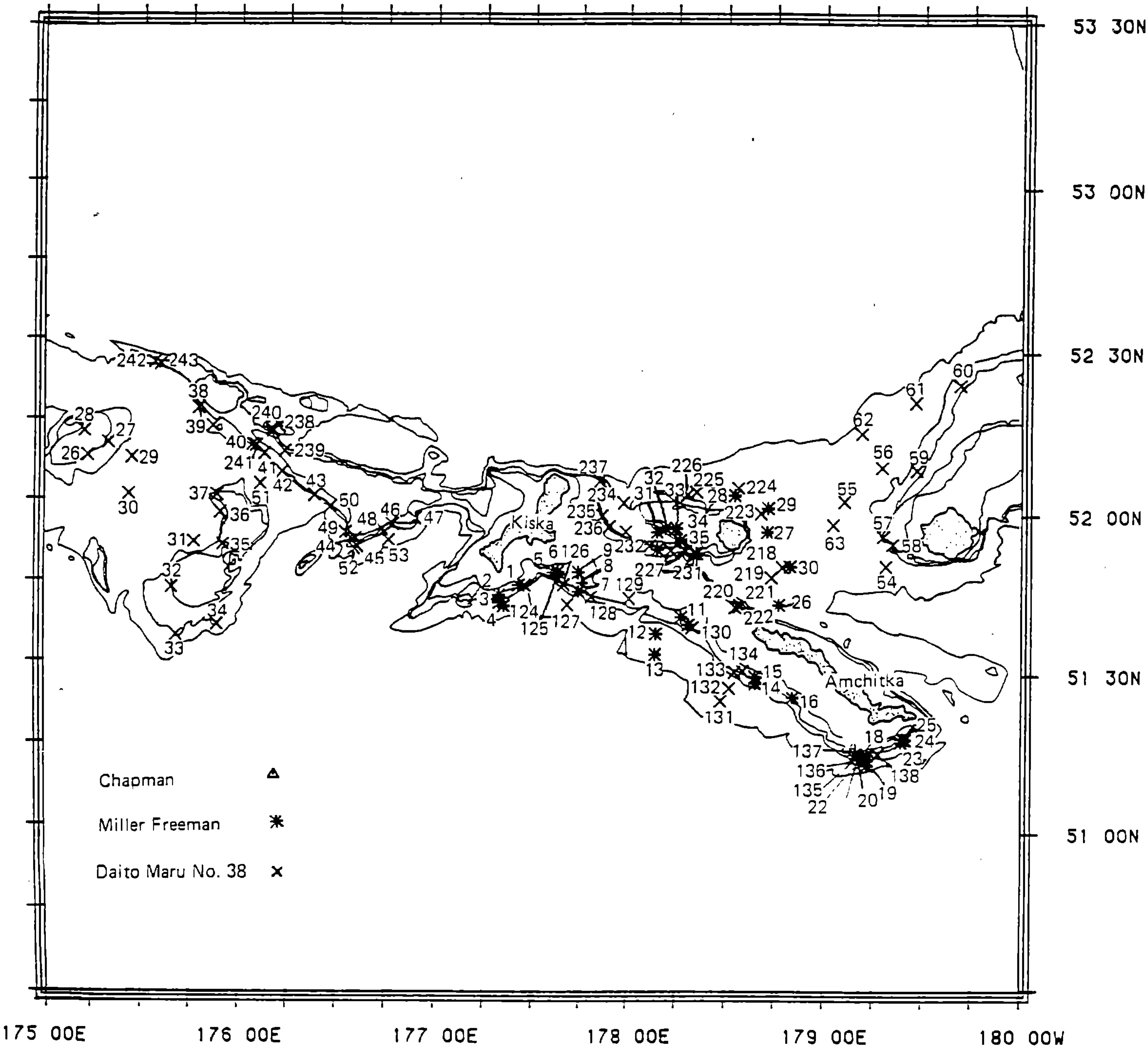

Figure 6.--Location of sampling stations, by vessel, completed from Buldir Island to Gareoli Island during the 1983 cooperative U.S.-Japan Aleutian Islands trawl survey.

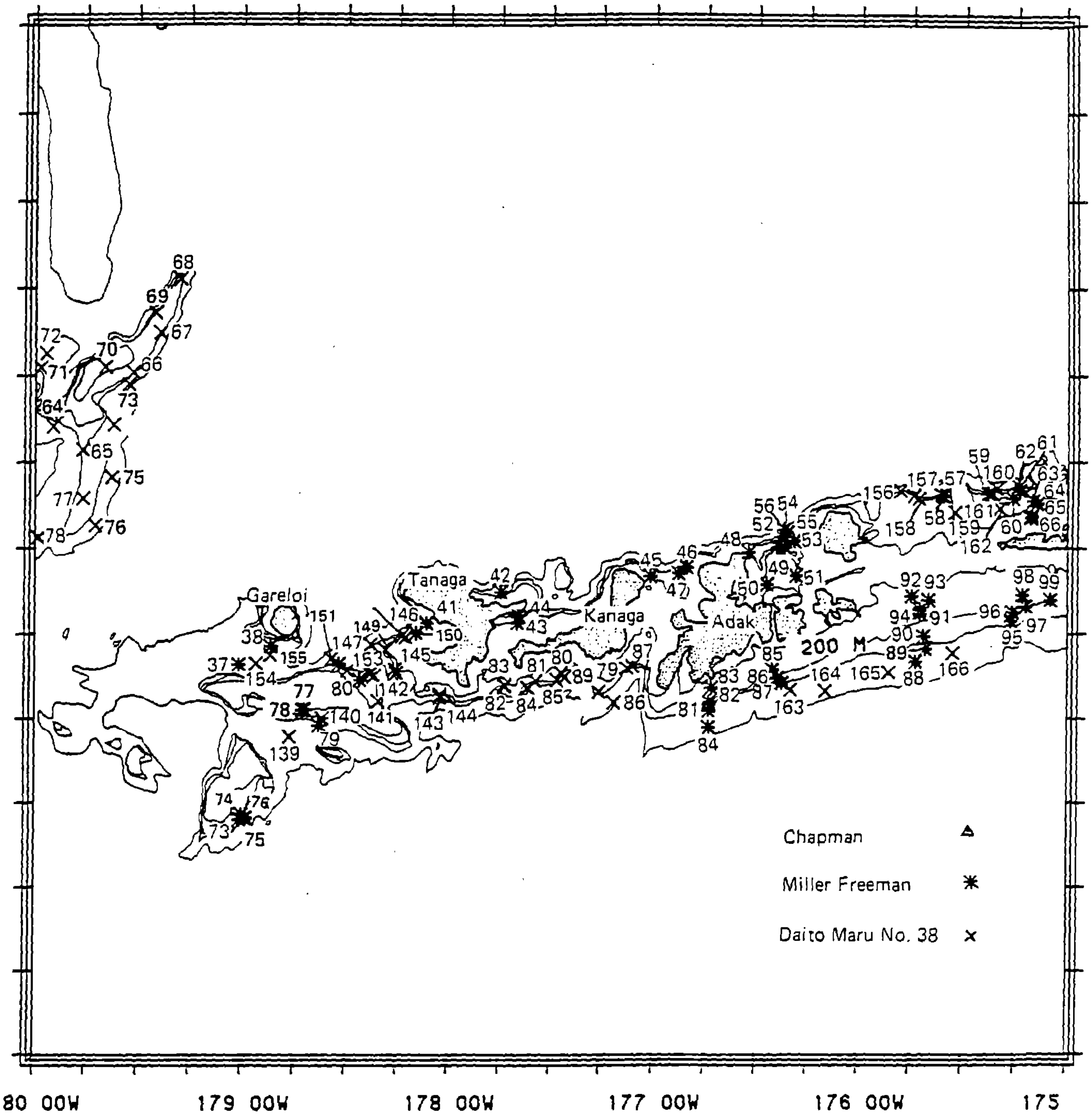

Figure 7.--Location of sampling stations, by vessel, completed from Petrel Bank to Atka Island during the 1983 cooperative U.S.-Japan Aleutian Islands trawl survey.

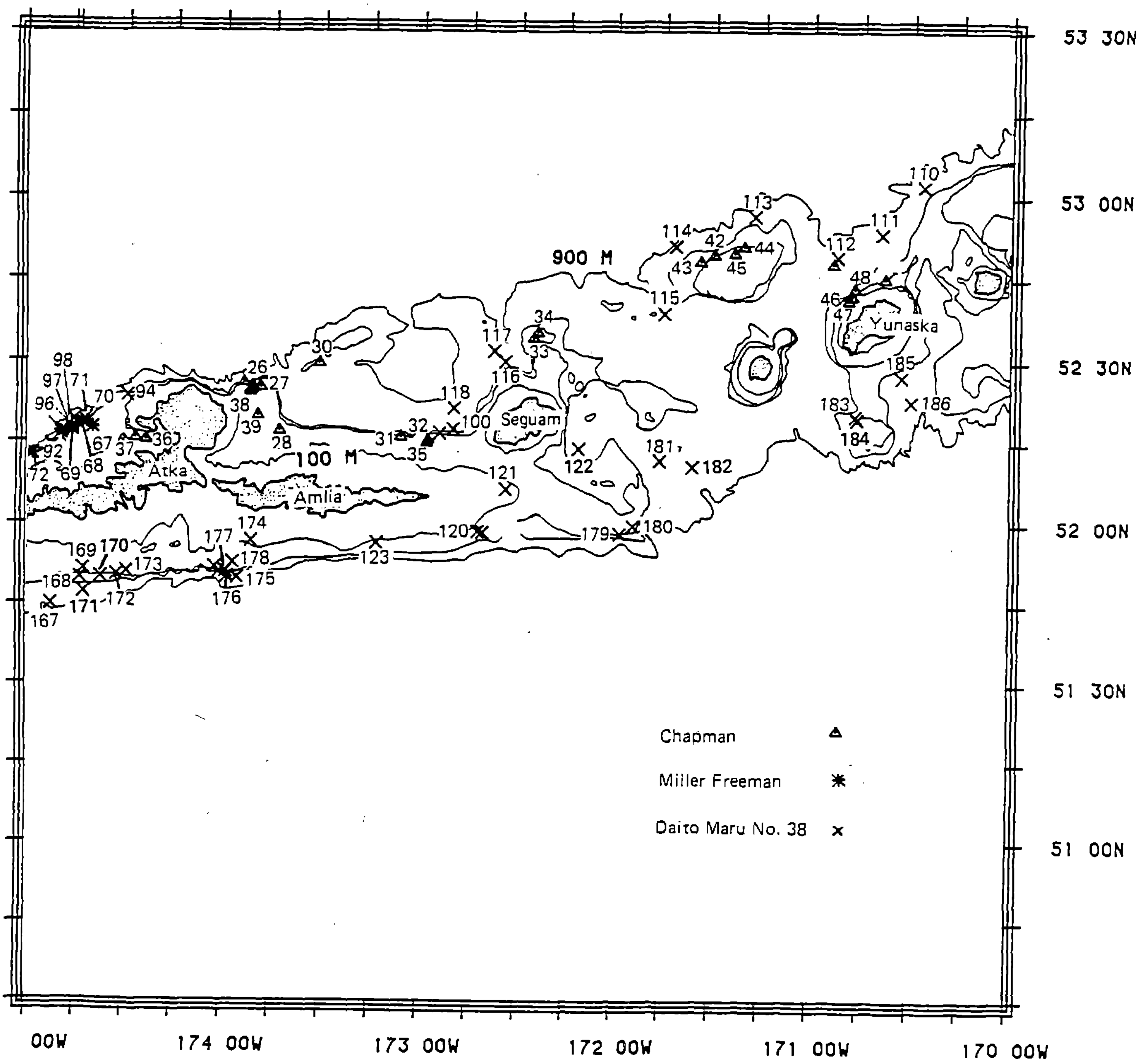

Figure 8.--Location of sampling stations, by vessel, completed from Atka Island to the Islands of Four Mountains during the 1983 cooperative U.S.-Japan Aleutian Islands trawl survey.

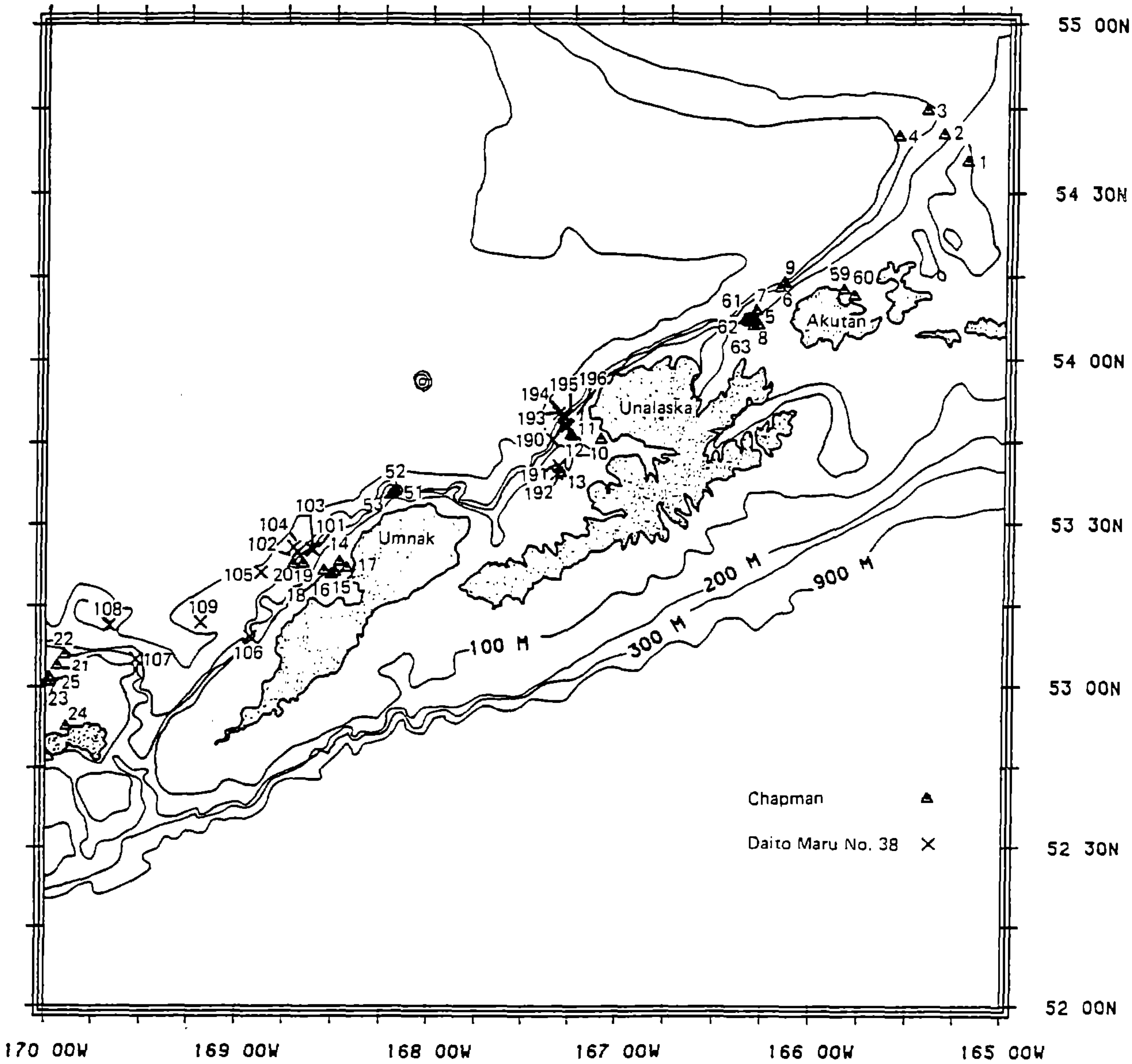

Figure 9. --Location of sampling stations, by vessel, completed in the southern Bering Sea subarea during the 1983 cooperative U.S. -Japan Aleutian Islands trawl survey.

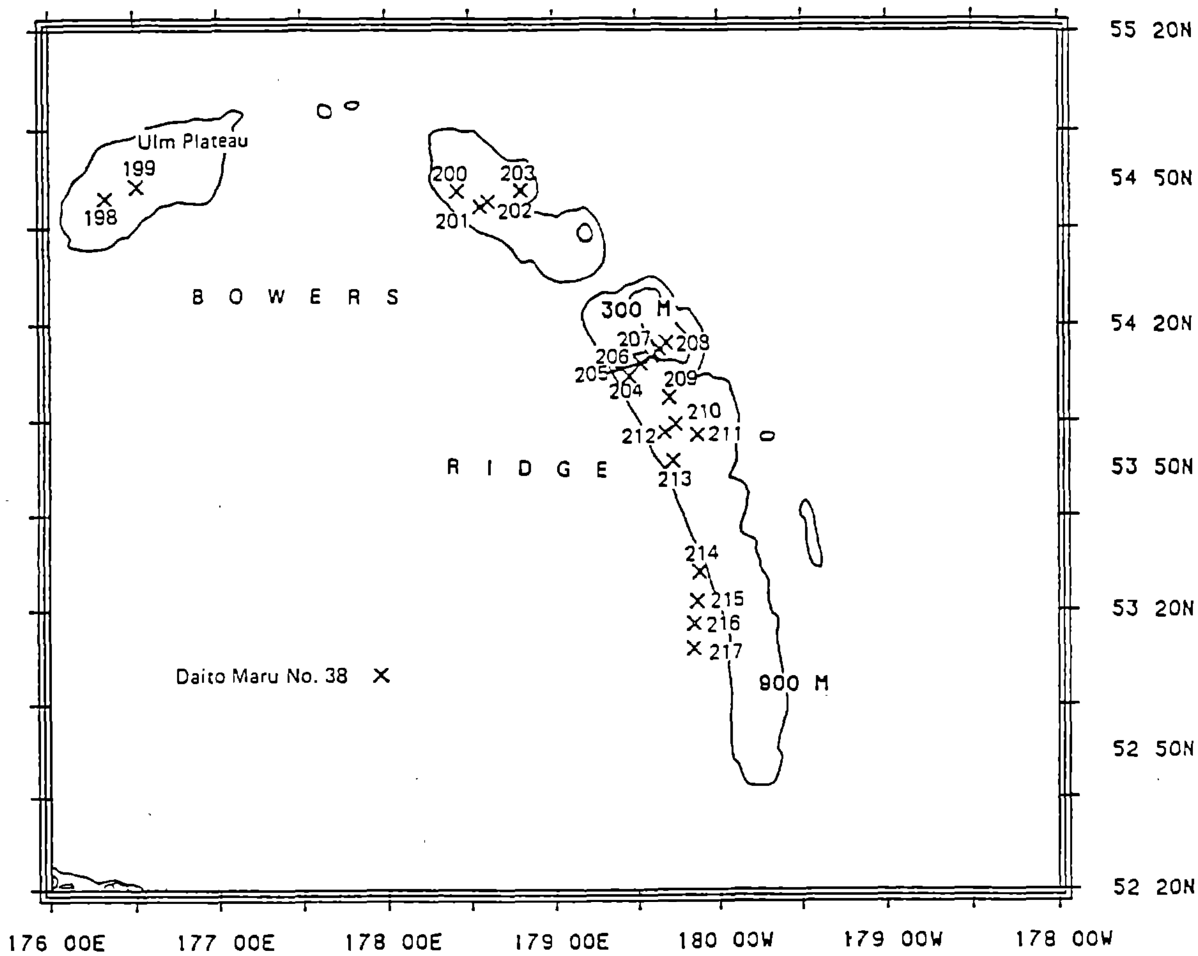

Figure 10.--Location of the sampling stations, by vessel, completed in the Bowers Range subarea during the 1983 cooperative U.S.-Japan Aleutian Islands trawl survey.

Table 6.--Average catch per unit effort (CPUE) (kg/h) and biomass (metric tons t) of the major fisheries resources in the Aleutian area.

Species	CPUE (kg/h)	Biomass (t)	Percent of total
Walleye pollock	655.6	539,380	27.7
Giant grenadier	435.4	381,219	19.6
Atka mackerel	359.5	306,782	15.8
Pacific ocean perch	174.8	144,079	7.4
Pacific cod	155.4	136,887	7.0
Sablefish	77.4	68,543	3.5
Greenland turbot	57.3	49,832	2.6
Northern rockfish	51.0	44,458	2.3
Arrowtooth flounder	46.7	39,888	2.0
Shortraker rockfish	32.0	27,914	1.4
Rougheye rockfish	23.8	20,581	1.1
Rock sole	23.5	19,316	1.0
Pacific halibut	21.9	17,771	0.9
Skates (Rajidae)	20.3	17,439	0.9
Coryphaenoides cinerus	19.8	17,106	0.9
Shortspine thornyhead	17.7	15,138	0.8
Red squid	16.3	13,992	0.7
Golden king crab	3.2	2,695	0.1
Rex sole	2.2	1,746	0.0 b/
Flathead sole	0.9	816	0.0 b/
Dover sole	0.5	389	0.0 b/
Other species a/	91.2	80,567	4.1
Total	2,286.5	1,946,538	100.0

a/ Includes all species not listed.
b/ Less than 0.1 % of the total biomass.

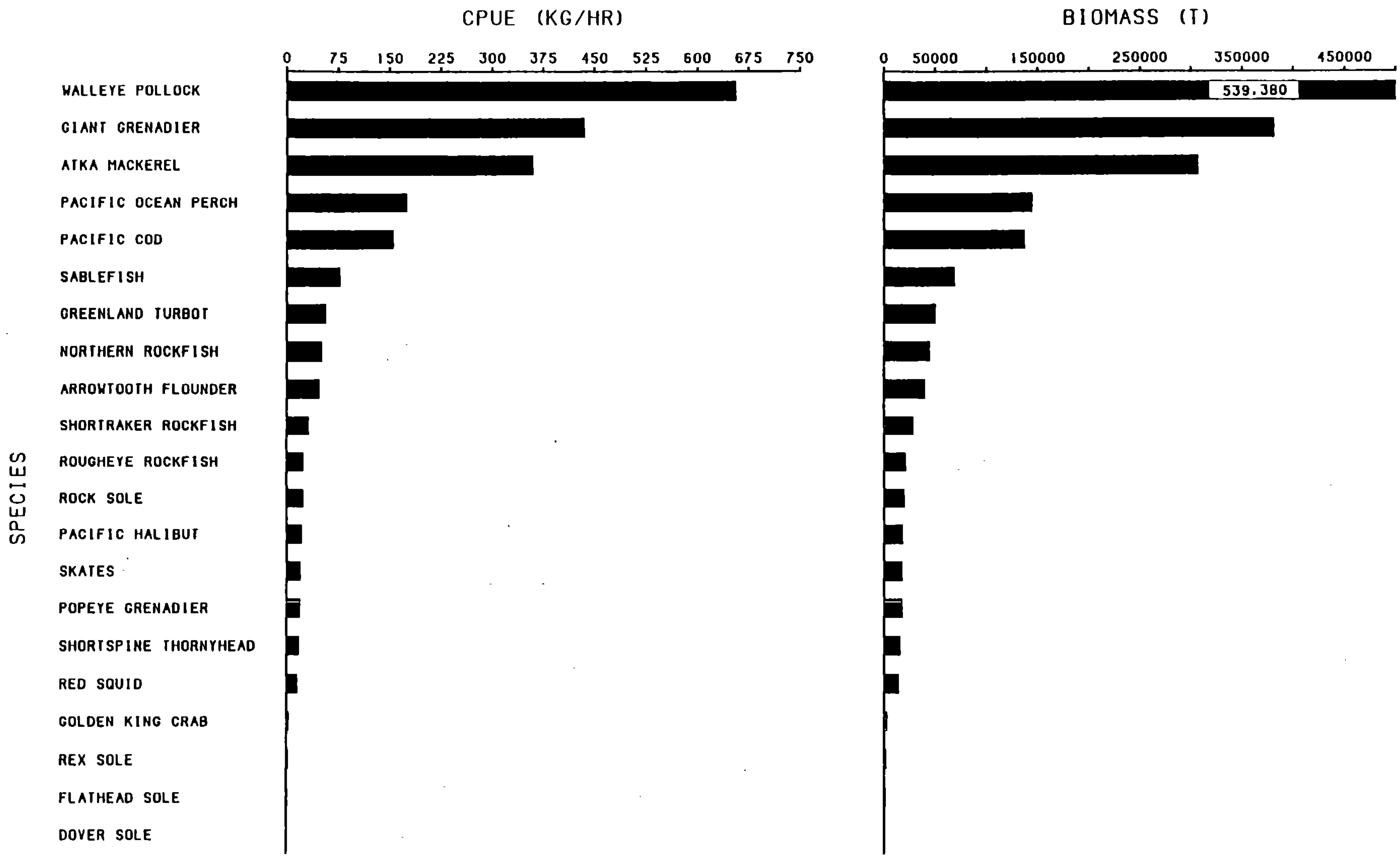

Figure 11.--Average catch per unit effort (CPUE) (kg/h) and estimated biomass of the major fisheries resources of the Aleutian Islands area.

similar amount of the total fish biomass. In the southern Bering Sea subarea, the groundfish resources are dominated by walleye pollock, Pacific ocean perch, and Pacific cod, which account for 89% of the total mean catch rate and 89% of the total fish biomass (Table 7, Fig. 12).

Within the Aleutian Islands, the order of abundance of the dominant species changed within subareas. Giant grenadier occurred as one of the six most abundant species in all subareas, while walleye pollock; Pacific ocean perch, Atka mackerel and Pacific cod were a major component in four of the five subareas (Tables 8-12, Figs. 13-17). Of the commercially important invertebrates found in the survey area, only golden king crab (*Lithodes aequispina*) and red squid (*Berryteuthis magister*) occurred at abundance levels, which placed them in the top 20 species.

Overall Distribution and Abundance of Principal Species of Fish

Walleye pollock (*Theragra chalcogramma*)

Walleye pollock occurred in densest concentrations in the areas from Kiska to Amchitka Islands in the western Aleutians; Tanaga, Kanaga, Atka, and Amlia Islands in the eastern Aleutians; and off Makushin Bay and Akutan Pass in the southern Bering Sea subareas (Figs. 18-21). The highest mean catch rate (2,179 kg/h) occurred in the southern Bering Sea subarea, and was triple the mean catch rates obtained in the Aleutian Islands area (656 kg/h Table 13). Mean catch rates in the Aleutian Islands subareas, with the exception of the Bowers Ridge subarea, ranged from 573 to 875 kg/h and were somewhat higher in the southwest and northwest subareas. The highest abundance was found in the 101- to 200-m and 201- to 300-m depth intervals in the Aleutian Islands area, while in the southern Bering Sea subarea, walleye pollock occurred in high abundance at all depth intervals shallower than 300 m (Fig. 22). The biomass

Table 7.--Average catch per unit effort (kg/h) and biomass (t) of the major fisheries resources in the southern Bering Sea subarea.

Species	CPUE (kg/h)	Biomass (t)	Percent of total
Walleye pollock	2,179.4	282,684	54.4
Pacific ocean perch	738.3	97,479	18.8
Pacific cod	353.5	45,624	8.8
Greenland turbot	115.7	14,033	2.7
Shortraker rockfish	100.8	13,080	2.5
Sablefish	80.4	9,871	1.9
Arrowtooth flounder	76.3	9,522	1.8
Pacific halibut	56.3	7,304	1.4
Rex sole	34.9	4,442	0.9
Rock sole	32.1	4,025	0.8
Skates	24.4	3,175	0.6
Rougheye rockfish	22.4	2,829	0.5
Giant grenadier	13.9	1,766	0.3
Northern rockfish	12.4	1,516	0.3
Shortspine thornyhead	11.2	1,414	0.3
Popeye grenadier	9.7	1,254	0.2
Flathead sole	5.1	694	0.1
Red squid	3.3	426	0.0 b/
Dover sole	0.9	117	0.0 b/
Golden king crab	0.3	32	0.0 b/
Atka mackerel	0.1	10	0.0 b/
Other species a/	137.5	17,824	3.4
Total	4,008.9	519,121	100.0

a/ Includes all species not listed.
b/ Less than 0.1% of the total biomass.

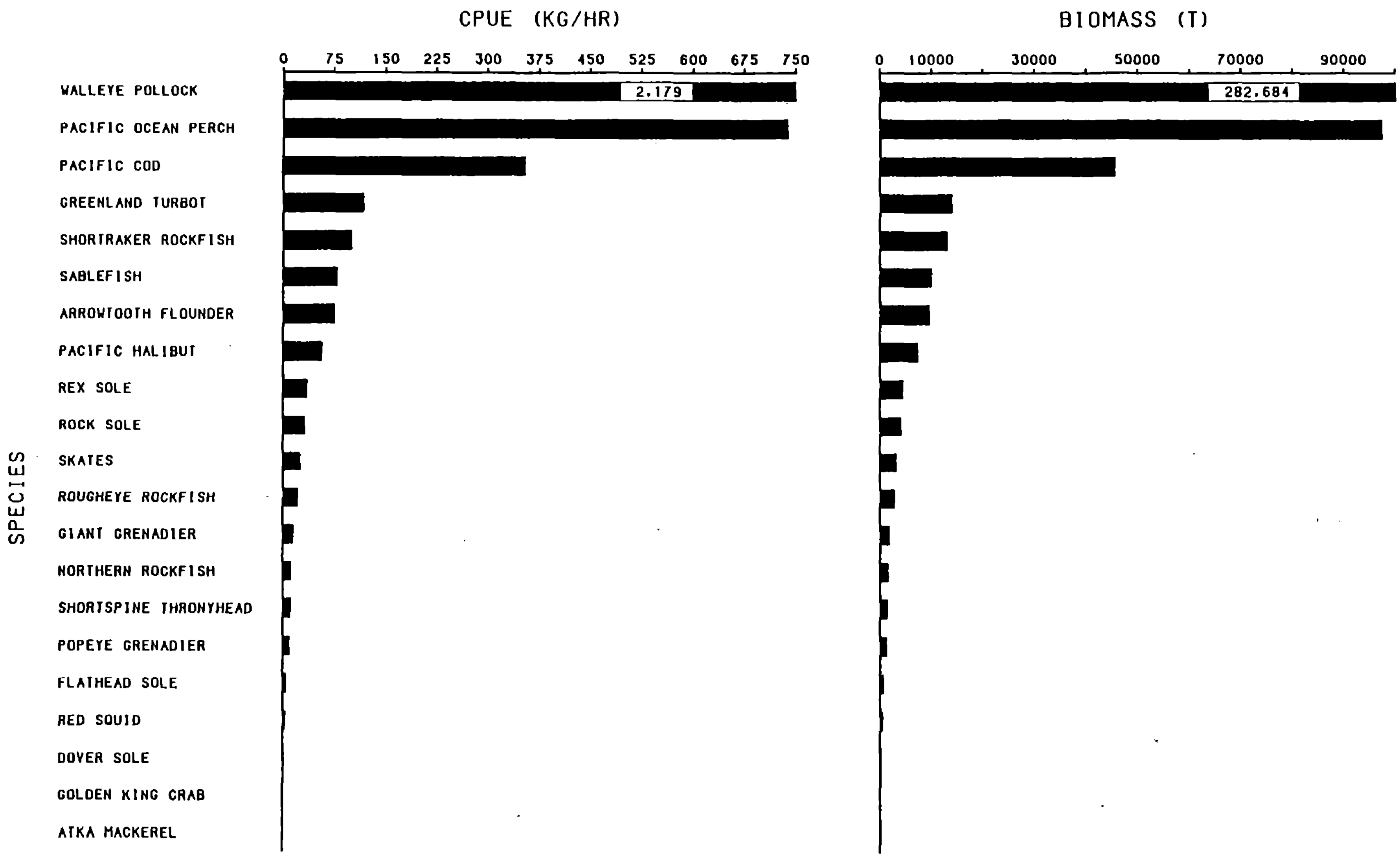

Figure 12. --Average catch per unit effort (kg/h) and estimated biomass (t) of the major fisheries resources of the southern Bering Sea subarea.

Table 8.--Average catch per unit effort (kg/h) and estimated biomass (t) of the major fisheries resources in the southwest subarea.

Species	CPUE (kg/h)	Biomass (t)	Percent of total
Walleye pollock	875.3	168,228	34.4
Atka mackerel	673.7	138,789	28.4
Pacific ocean perch	209.7	42,422	8.7
Giant grenadier	175.4	40,233	8.2
Pacific cod	92.2	18,129	3.7
Northern rockfish	82.6	16,085	3.3
Red squid	47.8	9,674	2.0
Shortraker rockfish	34.4	7,586	1.6
Rock sole	33.3	6,369	1.3
Rougheye rockfish	24.0	4,937	1.0
Shortspine thornyhead	22.5	4,705	1.0
Arrowtooth flounder	21.1	4,244	0.9
Popeye grenadier	20.2	4,188	0.9
Sablefish	16.8	3,568	0.7
Skates	14.5	3,050	0.6
Golden king crab	6.8	1,411	0.3
Greenland turbot	6.5	1,344	0.3
Pacific halibut	5.8	1,148	0.2
Rex sole	3.5	660	0.1
Flathead sole	2.0	380	0.0 b/
Dover sole	0.1	24	0.0 b/
Other species a/	56.9	11,542	2.3
Total	2,425.3	488,716	100.0

a/ Includes all species not listed.
b/ Less than 0.1 % of the total biomass.

Table 9.--Average catch per unit effort (kg/h) and biomass (t) of the major fisheries resources encountered in the southeast subarea.

Species	CPUE (kg/h)	Biomass (t)	Percent of total
Walleye pollock	585.2	97,721	23.6
Pacific ocean perch	367.4	65,991	16.0
Atka mackerel	356.8	66,870	16.2
Giant grenadier	323.7	59,639	14.4
Pacific cod	177.5	34,461	8.3
Sablefish	78.9	14,369	3.5
Northern rockfish	62.5	11,034	2.7
Pacific halibut	38.5	6,670	1.6
Arrowtooth flounder	36.6	6,542	1.6
Shortraker rockfish	28.4	5,486	1.3
Rock sole	21.8	4,029	1.0
Rougheye rockfish	21.1	3,805	0.9
Skates	20.4	3,546	0.9
Popeye grenadier	14.9	2,860	0.7
Shortspine thornyhead	12.1	2,318	0.6
Red squid	8.2	1,581	0.4
Greenland turbot	6.3	1,166	0.3
Rex sole	2.1	392	0.0 b/
Golden king crab	1.8	298	0.0 b/
Dover sole	0.7	136	0.0 b/
Flathead sole	0.2	48	0.0 b/
Other species a/	124.8	24,461	5.9
Total	2,289.9	413,423	100.0

a/ Includes all species not listed.
b/ Less than 0.1 % of the total biomass.

Table 10.--Average catch per unit effort (kg/h) and biomass (t) of the major fisheries resources in the northwest subarea.

Species	CPUE (kg/h)	Biomass (t)	Percent of total
Giant grenadier	1,124.5	174,900	41.4
Walleye pollock	573.1	85,323	20.2
Atka mackerel	281.3	46,840	11.1
Pacific cod	268.4	44,010	10.4
Northern rockfish	79.0	14,197	3.4
Arrowtooth flounder	61.9	9,098	2.2
Greenland turbot	33.3	4,828	1.1
Pacific ocean perch	29.4	3,832	0.9
Rock sole	26.4	3,629	0.9
Skates	26.2	4,000	0.9
Popeye grenadier	22.5	3,490	0.8
Shortspine thornyhead	22.2	3,330	0.8
Shortraker rockfish	21.1	3,223	0.8
Pacific halibut	20.1	2,931	0.7
Sablefish	15.1	2,477	0.6
Red squid	11.2	1,761	0.4
Rougheye rockfish	8.8	1,294	0.3
Golden king crab	4.6	696	0.2
Rex sole	2.2	324	0.0 b/
Flathead sole	0.6	96	0.0 b/
Dover sole	0.1	8	0.0 b/
Other species a/	80.2	11,789	2.8
Total	2,712.4	422,076	100.0

a/ Includes all species not listed.
b/ Less than 0.1 % of the total biomass.

Table 11.--Average catch per unit effort (kg/h) and biomass (t) of the major fisheries resources in the northwest subarea.

Species	CPUE (kg/h)	Biomass (t)	Percent of total
Giant grenadier	868.8	187,999	33.5
Walleye pollock	335.9	69,106	12.3
Atka mackerel	280.2	54,281	9.7
Pacific cod	207.8	47,117	8.4
Northern rockfish	191.9	40,286	7.2
Arrowtooth flounder	170.3	37,345	6.7
Greenland turbot	119.3	25,649	4.6
Pacific ocean perch	90.2	19,652	3.5
Rock sole	51.8	10,844	1.9
Skates	34.8	7,606	1.4
Popeye grenadier	32.5	6,750	1.2
Shortspine thornyhead	28.8	6,289	1.1
Shortraker rockfish	24.6	5,285	0.9
Pacific halibut	23.0	4,878	0.9
Sablefish	10.2	2,138	0.4
Red squid	9.7	1,939	0.3
Rougheye rockfish	3.6	801	0.1
Golden king crab	1.6	313	0.0 b/
Rex sole	1.2	289	0.0 b/
Flathead sole	1.1	239	0.0 b/
Dover sole	0.9	195	0.0 b/
Other species a/	141.8	32,183	5.7
Total	2,630.1	561,184	100.0

a/ Includes all species not listed.
b/ Less than 0.1 % of the total biomass.

Table 12.--Average catch per unit effort (kg/h) and estimated biomass (t) of the major fisheries resources in the Bowers Ridge subarea.

Species	CPUE (kg/h)	Biomass (t)	Percent of total
Giant grenadier	398.5	37,341	61.1
Pacific ocean perch	58.4	6,185	10.1
Greenland turbot	54.1	5,149	8.4
Shortspine thornyhead	29.2	2,846	4.7
Rougheye rockfish	26.4	2,940	4.8
Popeye grenadier	17.6	1,690	2.8
Sablefish	10.3	1,012	1.7
Northern rockfish	10.2	1,004	1.6
Shortraker rockfish	7.3	775	1.3
Skates	5.5	554	0.9
Arrowtooth flounder	3.4	352	0.6
Pacific halibut	2.8	272	0.4
Red squid	1.8	175	0.3
Walleye pollock	1.1	109	0.2
Rex sole	0.6	57	0.0 c/
Golden king crab	0.5	51	0.0 c/
Dover sole	0.3	26	0.0 c/
Rock sole	0.0 b/	4	0.0 c/
Flathead sole	0.0 b/	2	0.0 c/
Atka mackerel	0.0 b/	2	0.0 c/
Pacific cod	0.0 b/	1	0.0 c/
Other species a/	6.0	592	0.1
Total	634.0	61,139	100.0

a/ Includes all species not listed.
b/ Less than 0.1 kg/h.
c/ Less than 0.1% of the total biomass.

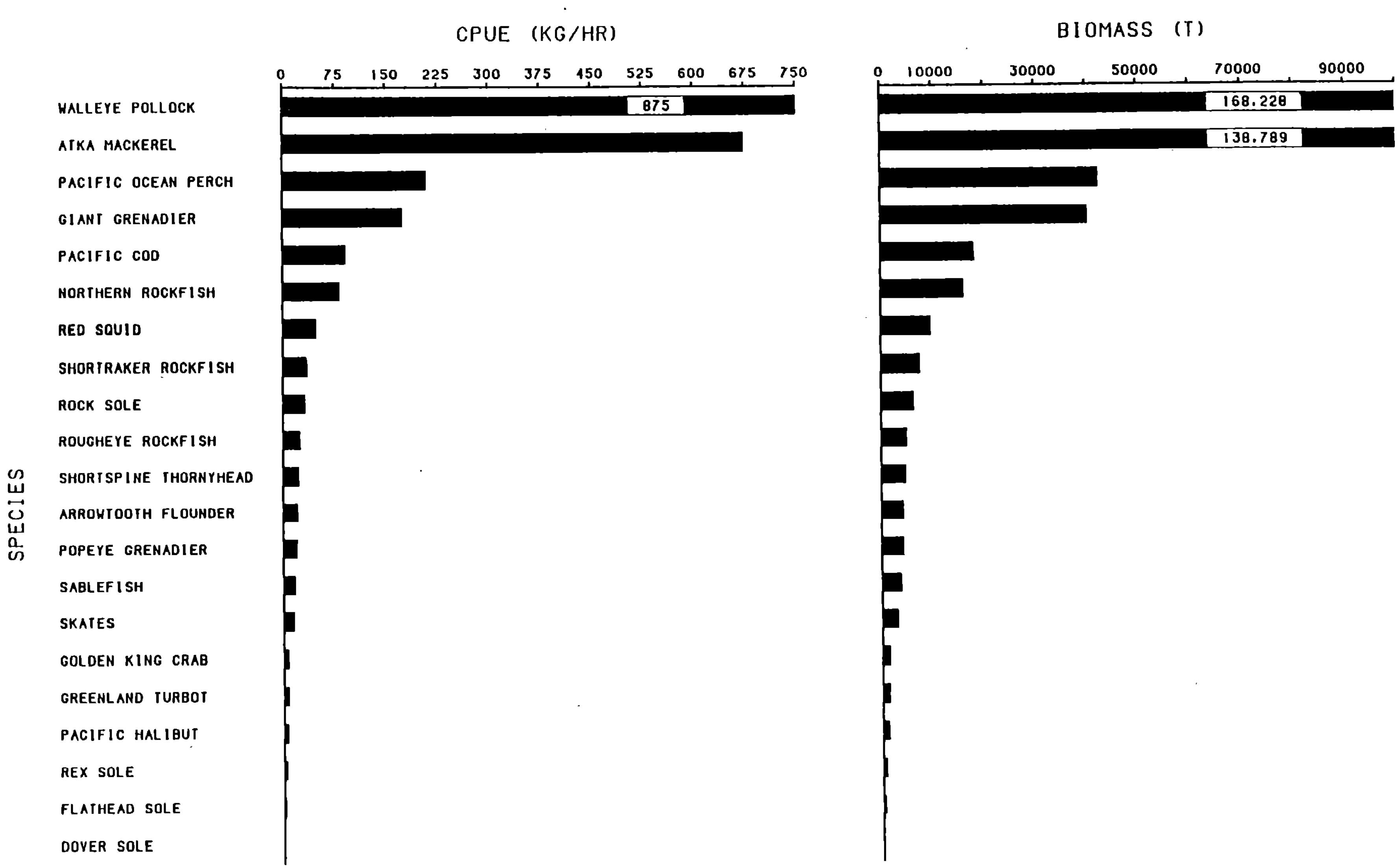

Figure 13.--Average catch per unit effort (kg/h) and estimated biomass (t) of the major fisheries resources of the southwest Aleutian Islands subarea.

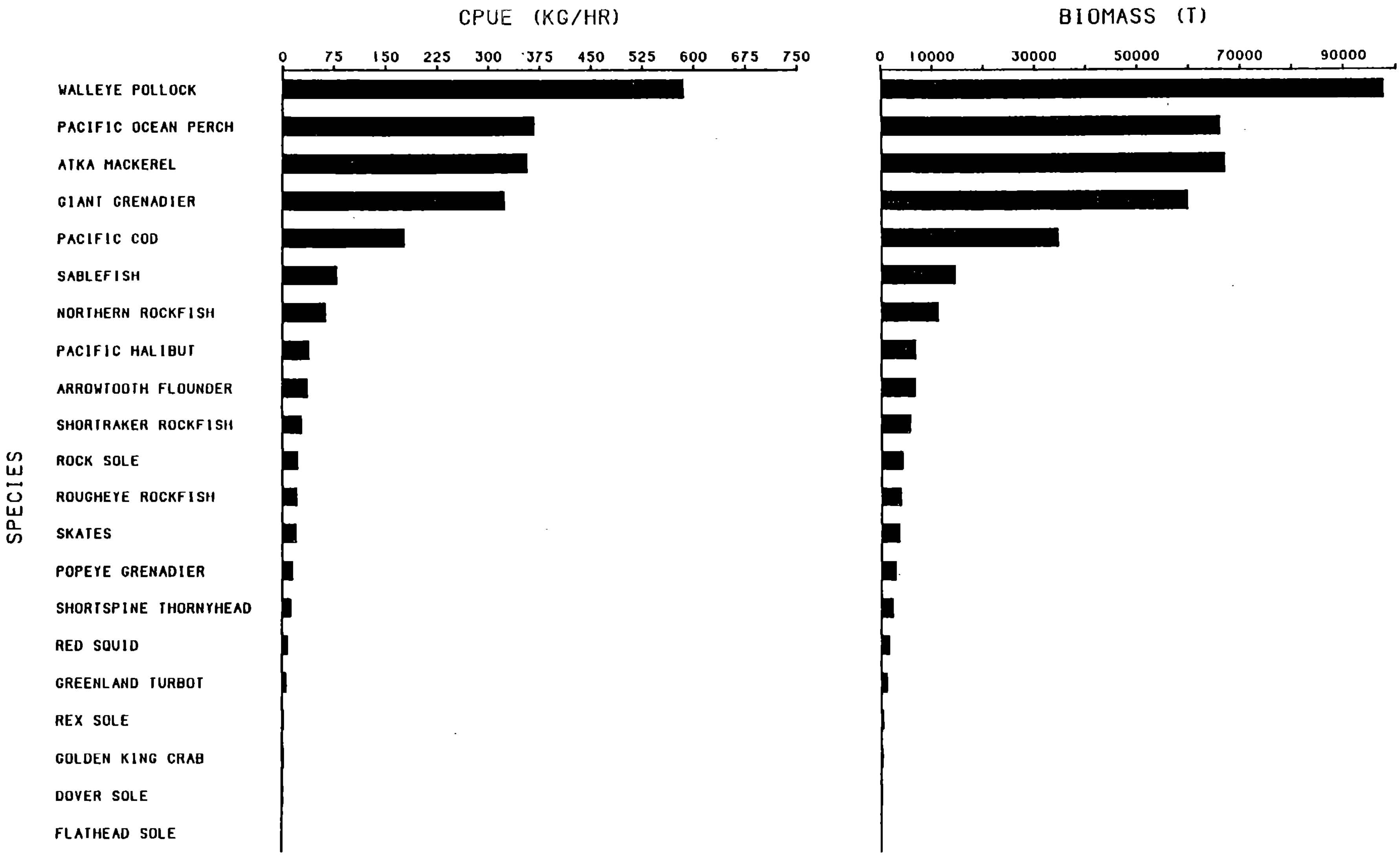

Figure 14.--Average catch per unit effort (kg/h) and estimated biomass (t) of the major fisheries resources of the southeast Aleutian Islands subarea.

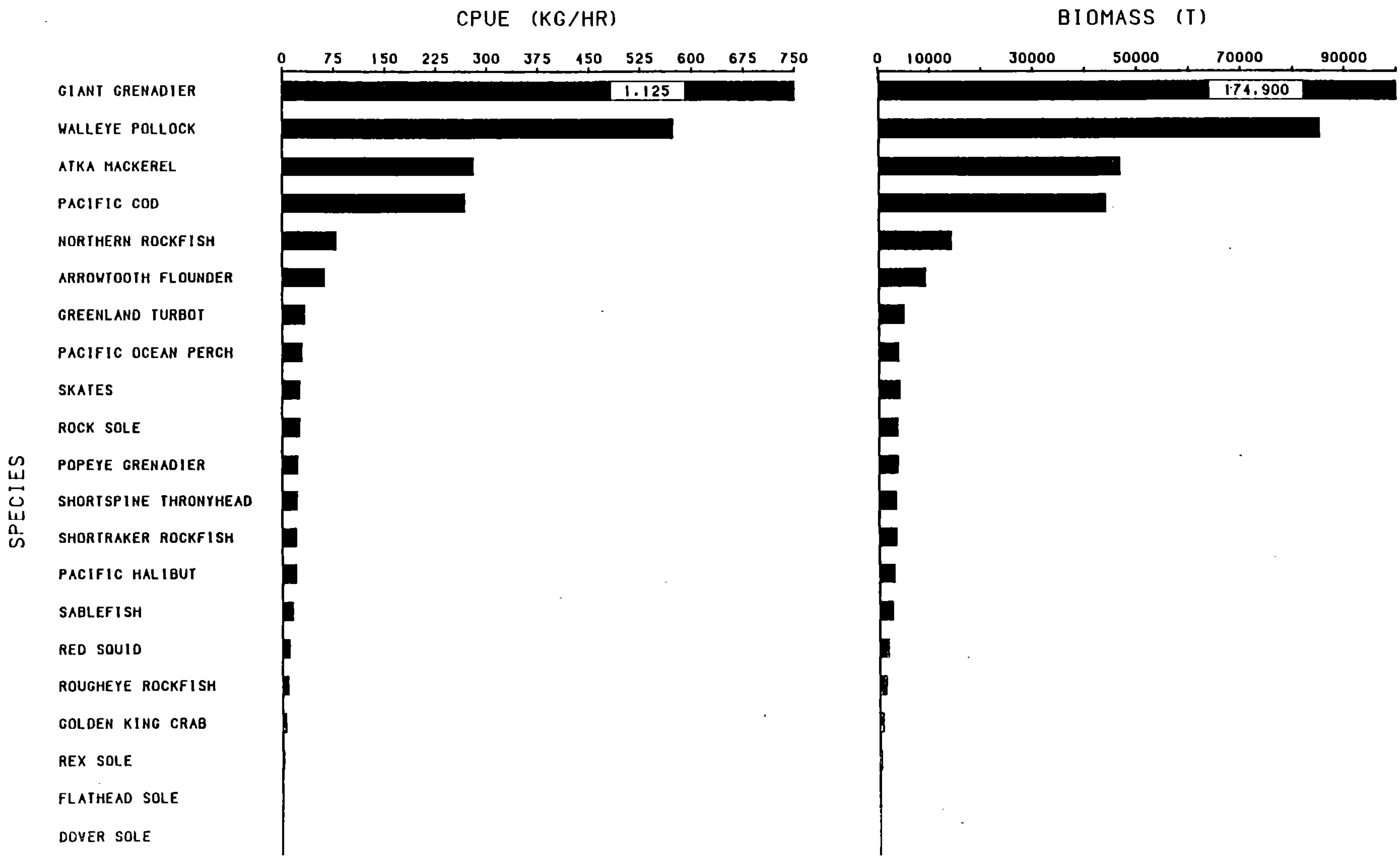

Figure 15. --Average catch per unit effort (kg/h) and estimated biomass (t) of the major fisheries resources of the northwest Aleutian Islands subarea.

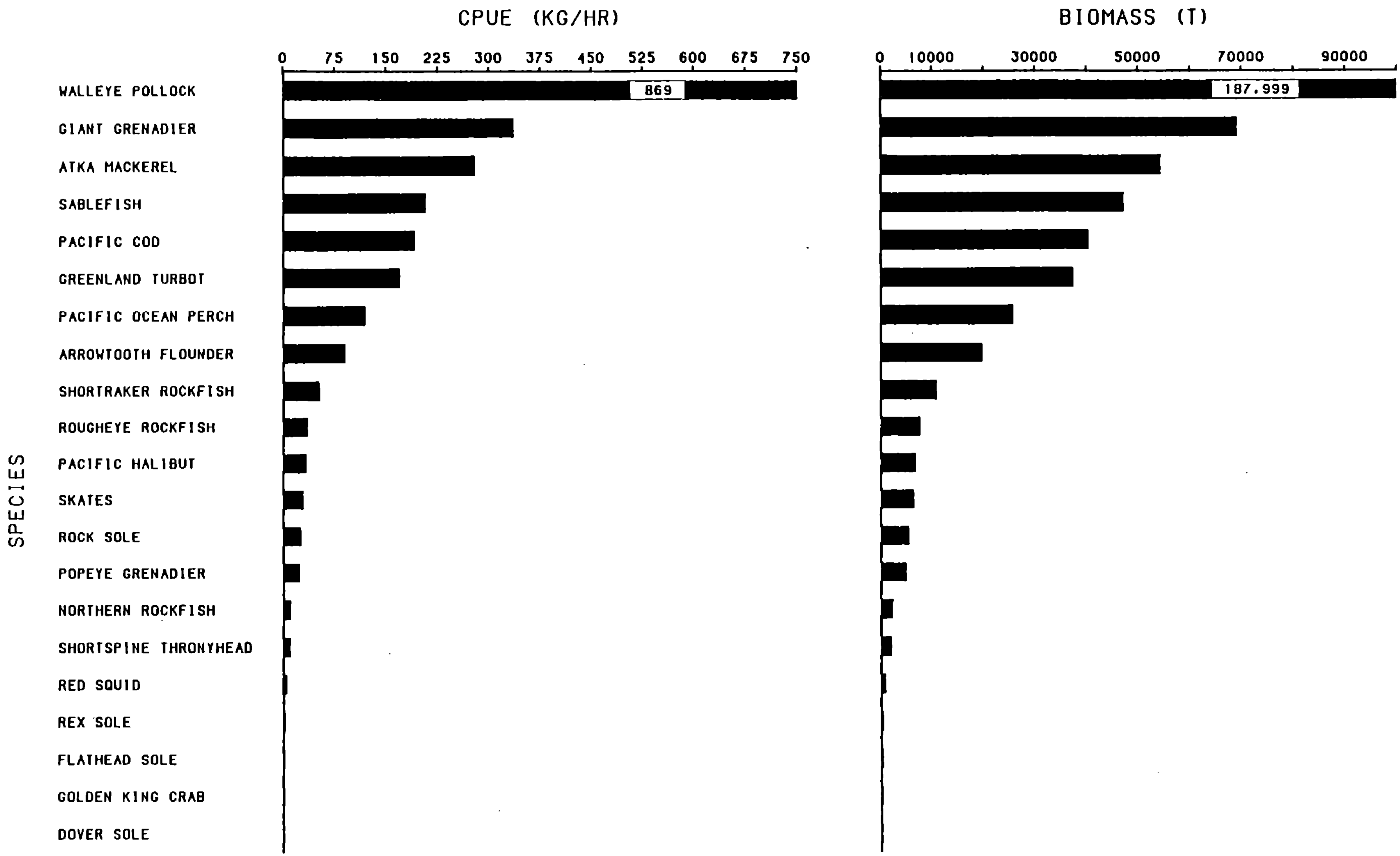

Figure 16. --Average catch per unit effort (kg/h) and estimated biomass (t) of the major fisheries resources in the northeast Aleutian Islands subarea.

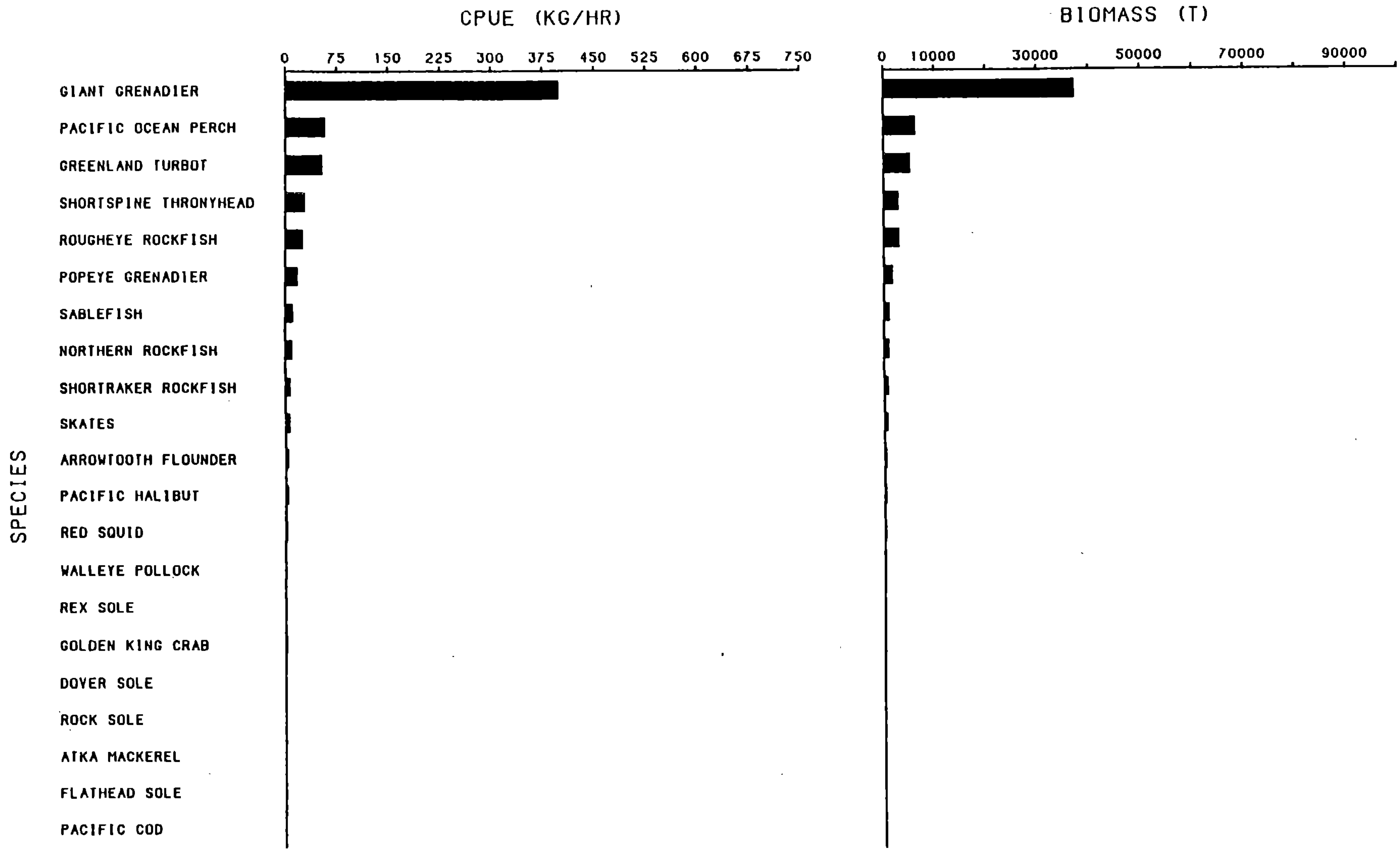

Figure 17. --Average catch per unit (kg/h) and estimated biomass (t) of the major fisheries resources in the Bowers Ridge Aleutian Islands subarea.

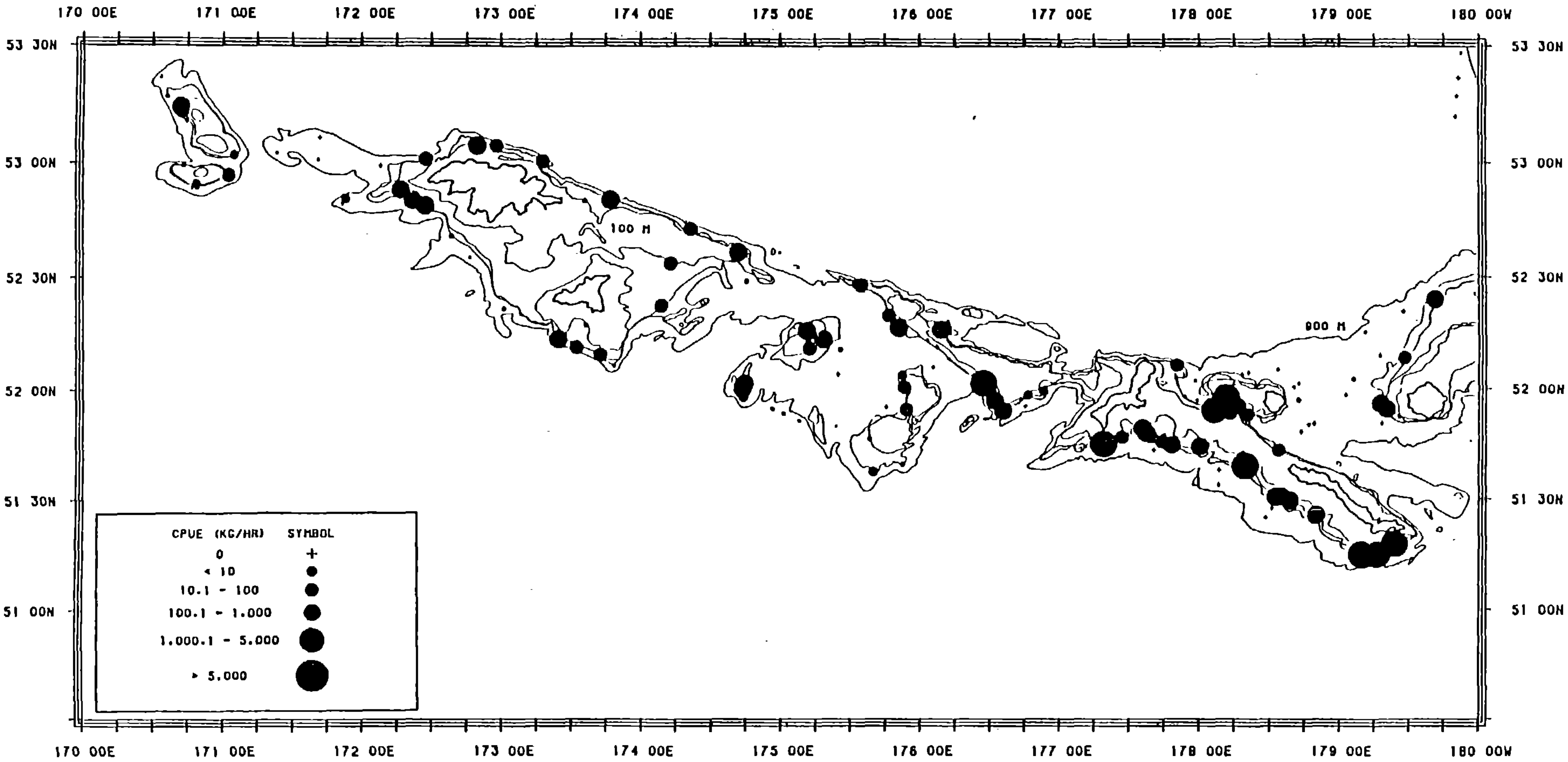

Figure 18. --Distribution and relative abundance of walleye pollock in the southwest and northwest subareas of the Aleutian region during the 1983 cooperative U.S. -Japan Aleutian Islands survey.

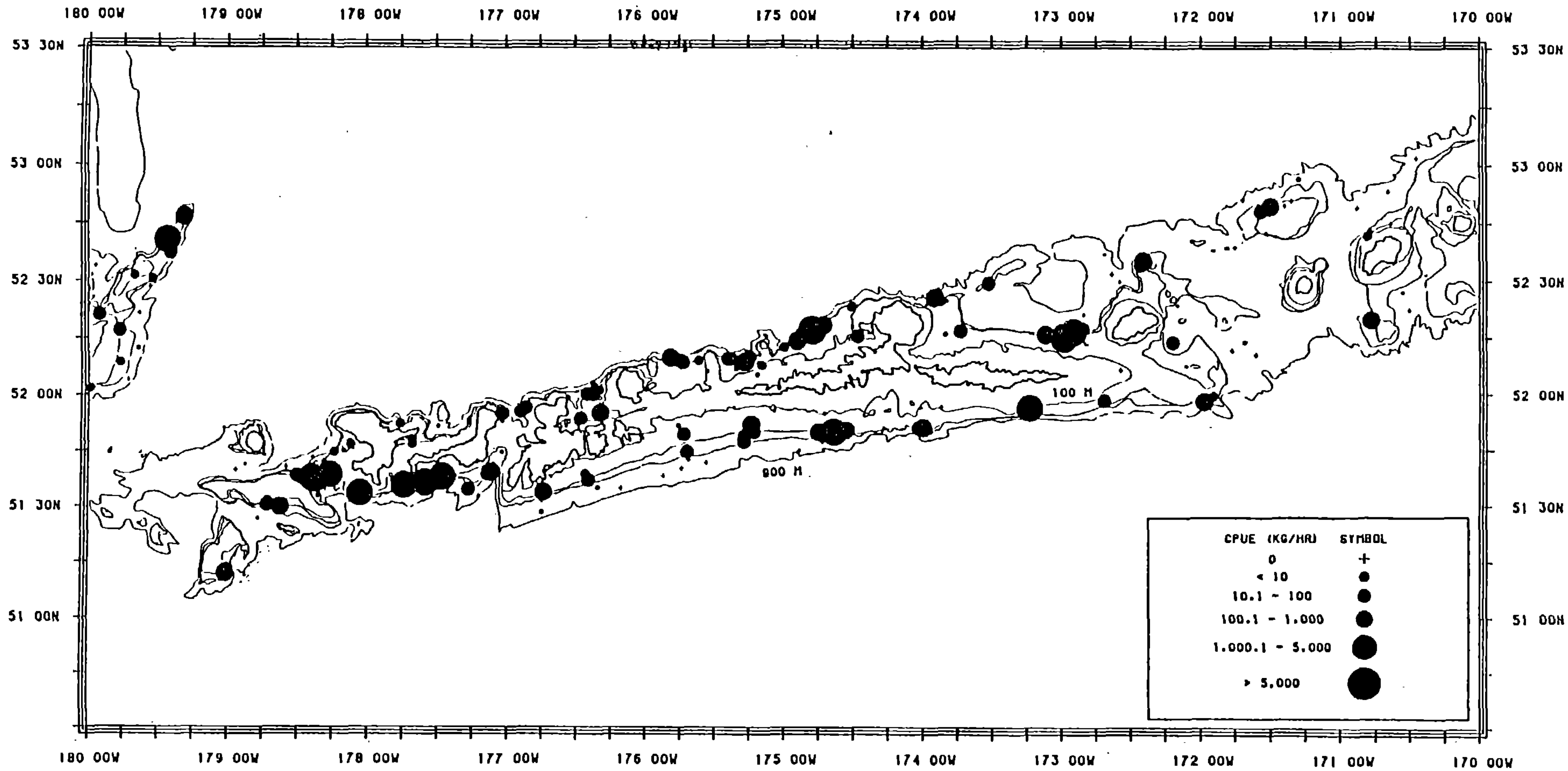

Figure 19. --Distribution and relative abundance of walleye pollock in the northeast and southeast subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

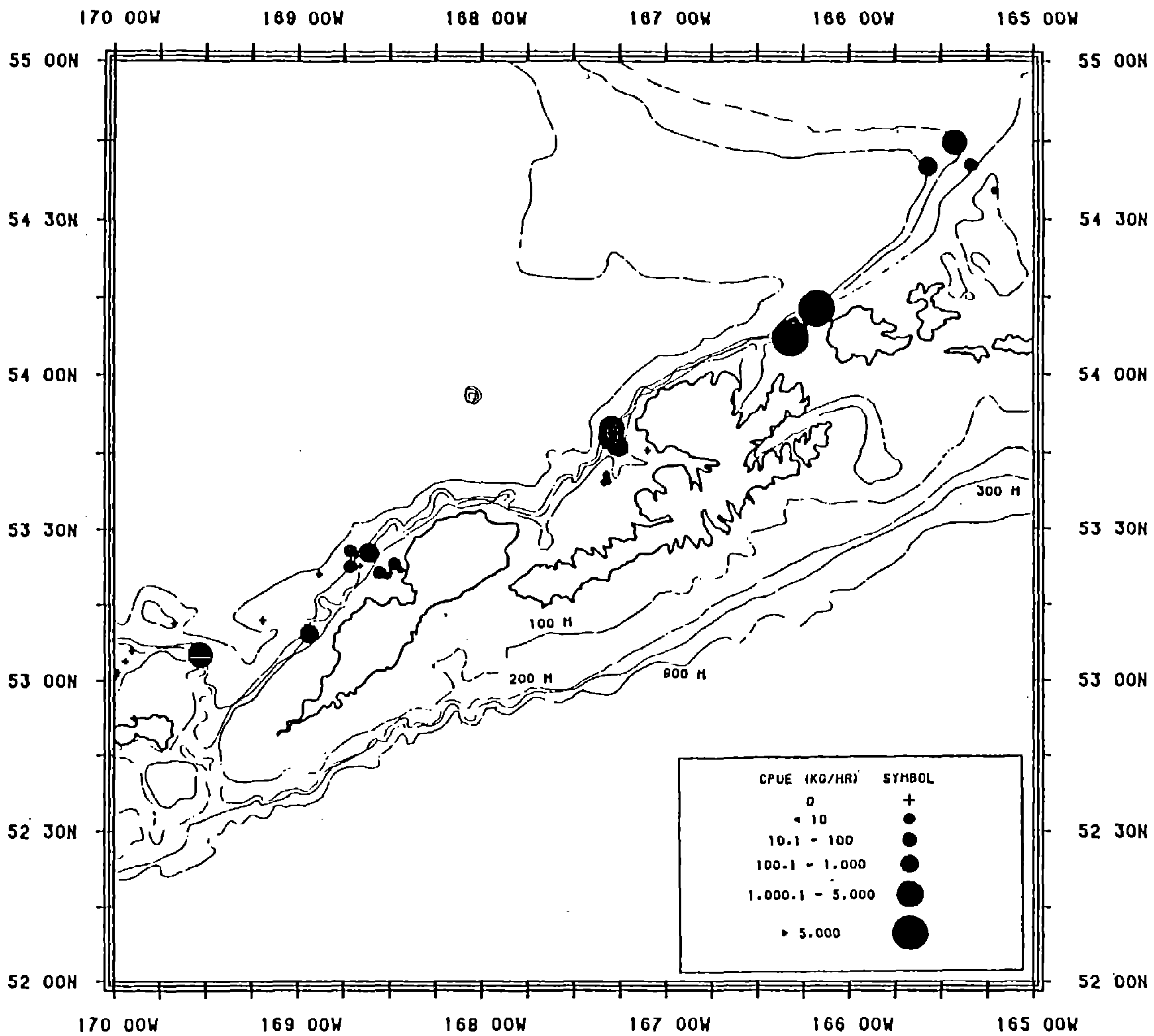

Figure 20. --Distribution and relative abundance of walleye pollock in the southern Bering Sea subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

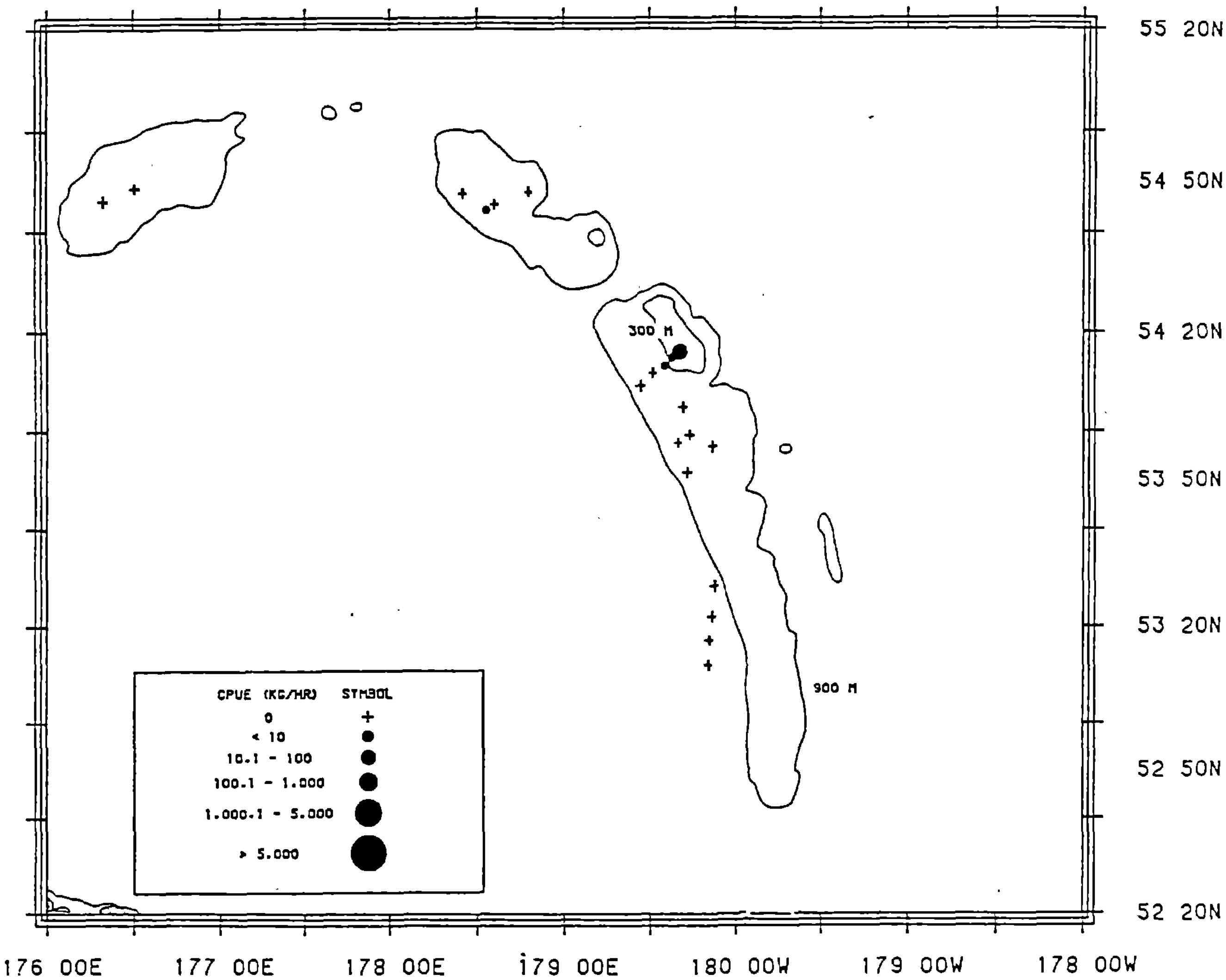

Figure 21.--Distribution and relative abundance of walleye pollock in the Bowers Ridge subarea of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

Table 13.--Mean CPUE (kg/h) and estimated biomass (t) for walleye pollock by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	178.4	18,583
		101-200	1,697.3	318,828
		201-300	1,854.4	200,212
		301-500	10.7	1,620
		501-900	0.4	137
		1-900	655.6	539,380
	Southwest	1-100	326.0	8,105
		101-200	2,209.2	128,211
		201-300	1,668.3	31,538
		301-500	9.9	291
		501-900	1.2	83
		1-900	875.3	168,228
	Southeast	1-100	92.3	3,167
		101-200	768.0	31,265
		201-300	1,886.2	62,836
		301-500	13.1	443
		501-900	0.3	10
		1-900	585.2	97,721
	Northwest	1-100	131.3	2,738
		101-200	735.5	21,552
		201-300	4,838.0	61,014
		301-500	0.0 a/	1
		501-900	0.3	18
		1-900	573.1	85,323
	Northeast	1-100	161.8	4,573
		101-200	2,465.8	137,698
		201-300	1,448.8	44,822
		301-500	20.4	885
		501-900	0.3	21
		1-900	868.8	187,999
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	34.1	102
		201-300	0.2	2
		301-500	0.0	0
		501-900	0.1	5
		1-900	1.1	109
Bering Sea				
	Southern	1-100	3,101.8	154,752
		101-200	3,202.9	105,247
		201-300	1,592.9	16,917
		301-500	410.5	5,768
		501-900	0.0	0
		1-900	2,179.4	282,684

a/ Less than 0.1 kg/h.
b/ No sampling area available.

WALLEYE POLLOCK

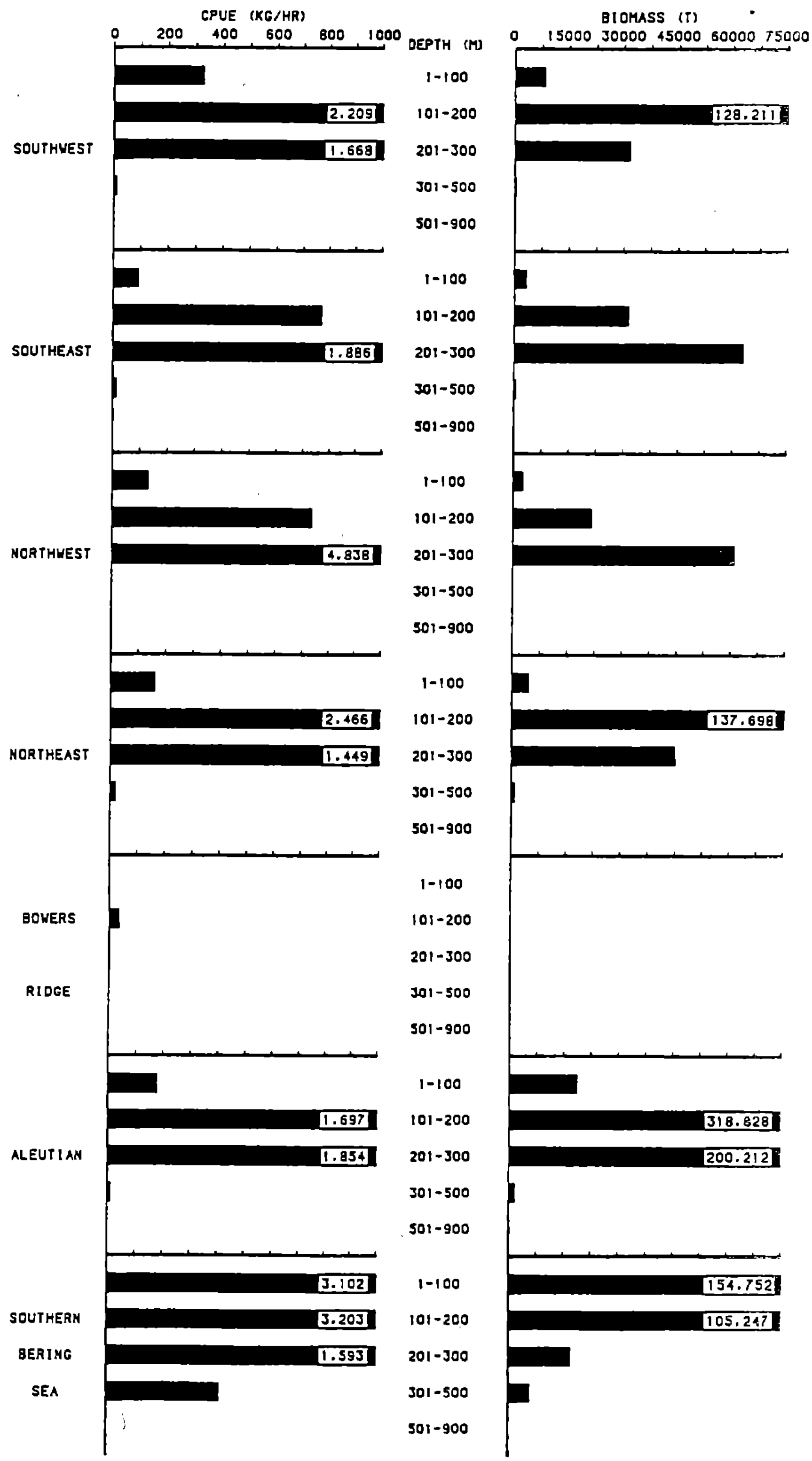

Figure 22 .--Mean CPUE (kg/h) and estimated biomass (t) for walleye pollock by area, subarea, and depth interval.

of walleye pollock in the Aleutian Islands area was estimated at 539,400 metric tons (t), almost double that of the southern Bering Sea subarea. Nearly two-thirds of the estimated biomass in the Aleutian Islands area was found in the northeast and southwest subareas.

With the exception of the Bowers Ridge subarea, the size composition curves of walleye pollock in the Aleutian Islands area were similar to the principal size modes (the lengths with the largest percentage of fish) occurring between 40 and 55 cm (Fig. 23). At depths greater than 200 m nearly all of the fish were greater than 40 cm but in the l0l- to 200-m depth interval smaller fish (20-30 cm) were observered in the catches. In the southern Bering Sea subarea, the principal size mode was very similar to the Aleutian Islands subareas with the exception of very few fish in the 20- to 30-cm interval. Small walleye pollock around 10 cm in length, however, were found to occur in catches in this subarea.

Giant grenadier (*Albatrossia pectoralis*)

Giant grenadier, a nonutilized species, occurred throughout the survey area but were primarily found in the Aleutian Islands subareas at depths greater than 500 m (Fig. 24). The northwest subarea had the highest mean catch rate (1,125 kg/h) and also the highest portion (46%) of the estimated biomass in the Aleutian Islands area, 382,200 t (Table 14).

The size composition of giant grenadier (snout to anus measurements) shows that the northeast and northwest Aleutian subareas had the largest average-size fish (Fig. 25). Within the Aleutian Islands subareas, the lengths of the principal modes varied, with the southwest and Bowers Ridge subareas having a higher percentage of smaller fish. By depth, larger-size primary modes and mean lengths were found in all Aleutian subareas in the

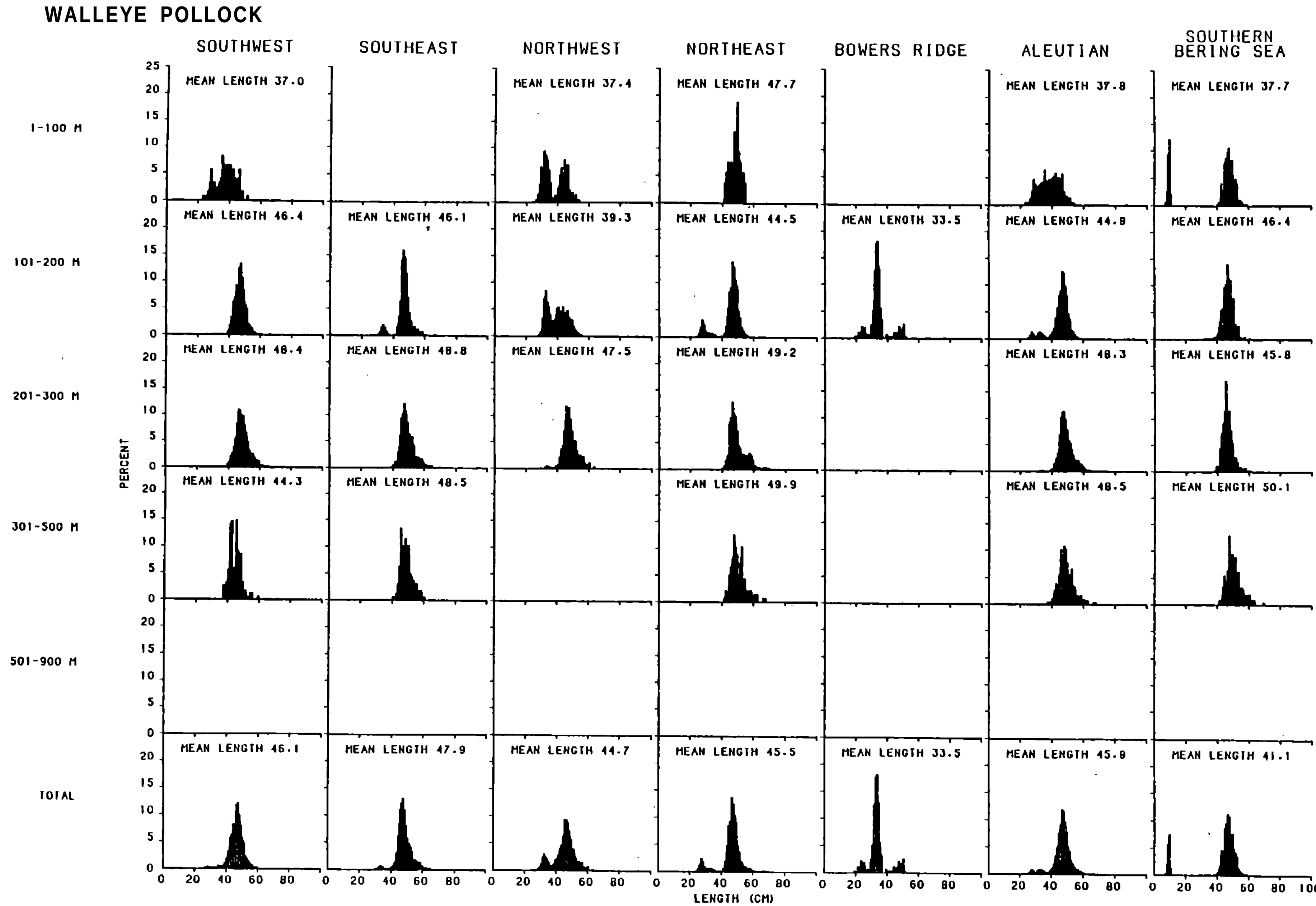

Figure 23. --Size composition of walleye pollock, sexes combined, by survey area, subarea, and depth zone.

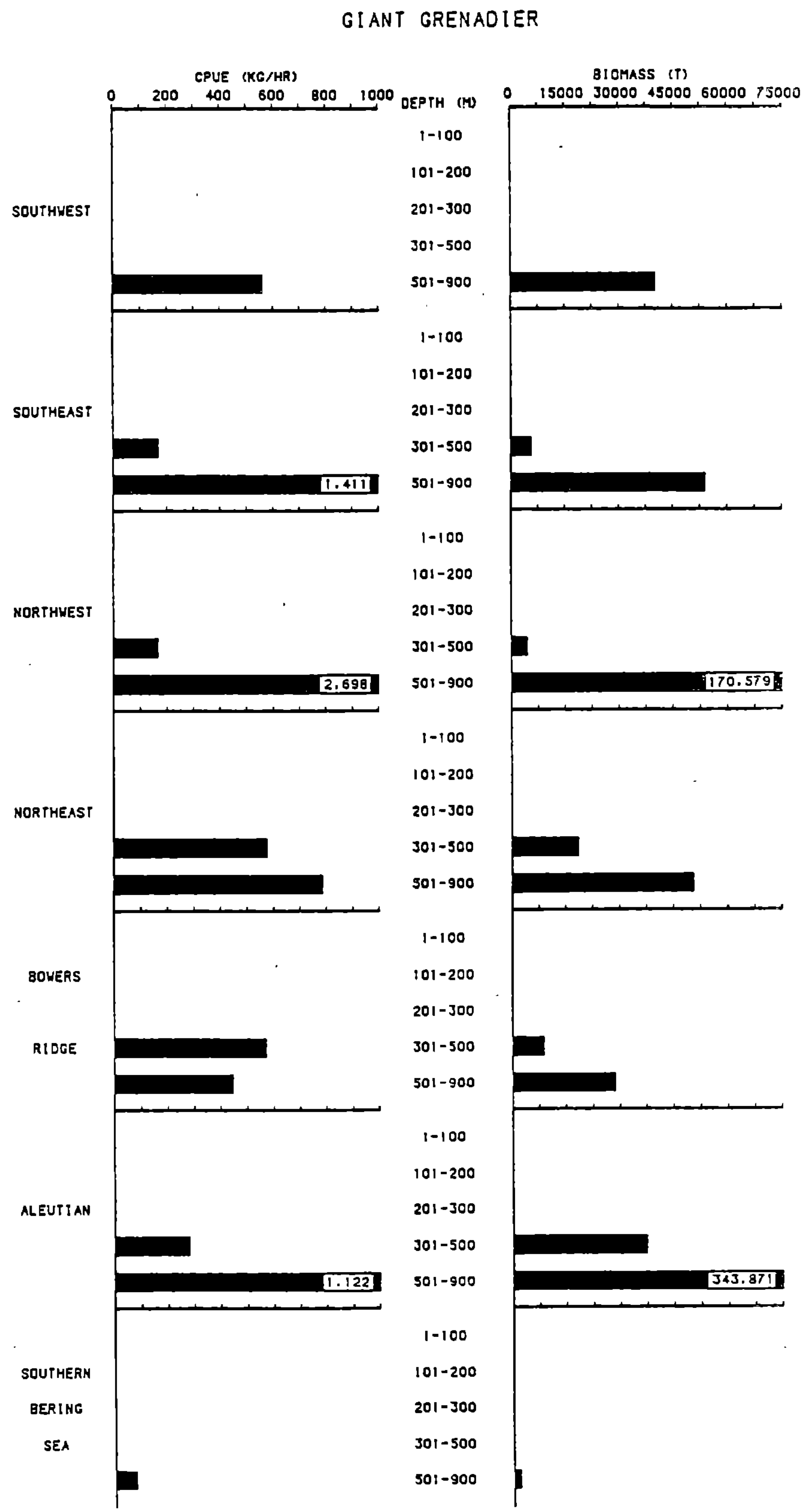

Figure 24.--Mean CPUE (kg/h) and estimated biomass (t) for giant grenadier by area, subarea, and depth interval.

Table 14.--Mean CPUE (kg/h) and estimated biomass (t) for giant grenadier by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	278.7	37,348
		501-900	1,122.3	343,871
		1-900	435.4	381,219
	Southwest	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	0.4	12
		501-900	560.7	40,221
		1-900	175.4	40,233
	Southeast	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	167.6	5,675
		501-900	1,410.5	53,964
		1-900	323.7	59,639
	Northwest	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	164.5	4,321
		501-900	2,698.0	170,579
		1-900	1,124.5	174,900
	Northeast	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	575.9	18,575
		501-900	785.4	50,531
		1-900	335.9	69,106
	Bowers Ridge	1-100	0.0*	0*
		101-200	0.0	0
		201-300	0.0	0
		301-500	570.2	8,765
		501-900	445.7	28,576
		1-900	398.5	37,341
Bering Sea				
	Southern	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	0.0	0
		501-900	77.4	1,766
		1-900	13.9	1,766

* No sampling area available.

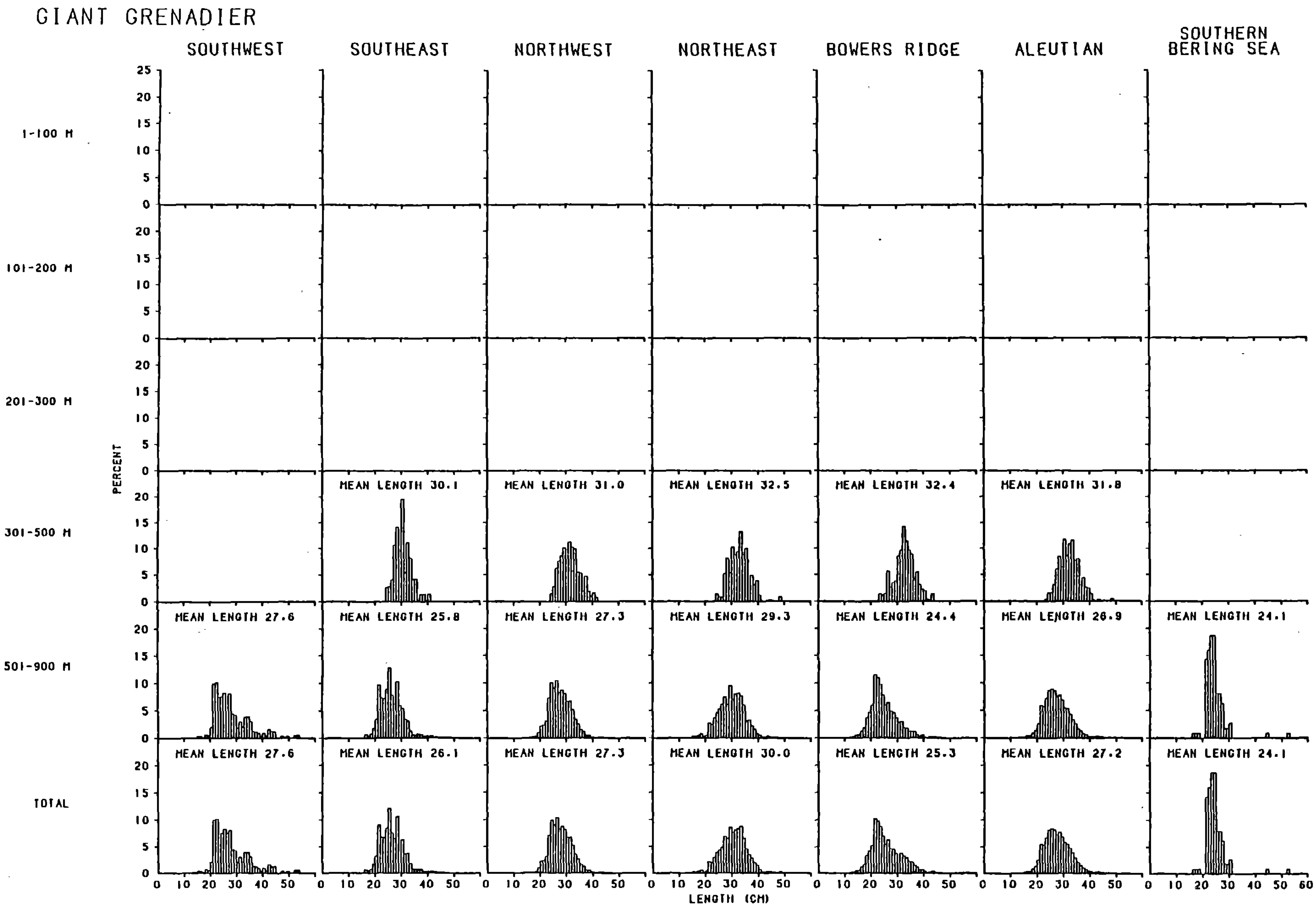

Figure 25. --Size composition of giant grenadier, sexes combined, by survey area, subarea, and depth zone.

301- to 500-m depth interval than in the 501- to 900-m depth interval.

Atka mackerel (Pleurogrammus monopterygius)

Dense concentrations of Atka mackerel were encountered intermittently throughout the survey area. In the western Aleutian Islands they occurred on Stalemate Bank, Tahoma Reef, and Buldir Reef; in the eastern Aleutian Islands they occurred on the Petrel Spur portion of Petrel Reef and in Seguam Pass (Figs. 26-29). The highest abundance occurred in the southwest (45%) and southeast (22%) subareas with no Atka mackerel present in catches from the Bowers Ridge subarea and only one small catch from the southern Bering Sea subarea (Table 15, Fig. 30). By depth, 99% of the estimated biomass resulted from the l- to 100-m and l0l- to 200-m depth intervals.

Size composition data indicate some differences in the size composition of Atka mackerel in the Aleutian Islands (Fig. 31). A complete absence of fish smaller than approximately 35 cm was observed in the southeast subarea while in the southwest subarea the data indicate a strong recruitment of fish 25-34 cm, and a lower percentage of larger fish. Considerably weaker recruitment was indicated for the northeast and northwest subareas where the size compositions were very similar but the principal size mode in the northwest subarea occurred at a slightly higher size range.

Pacific cod (Gadus macrocephalus)

Pacific cod were ubiquitous throughout the Aleutian Islands and the southern Bering Sea. Highest densities were encountered along the north side of the islands, in the southern Bering Sea and near Buldir Reef in the northwest subarea (Figs. 32-35). Mean CPUE's were highest in the southern Bering Sea (354 kg/h) and northwest (268 kg/h) subareas of the Aleutian Islands area; however, 78% of the biomass was evenly distributed between the

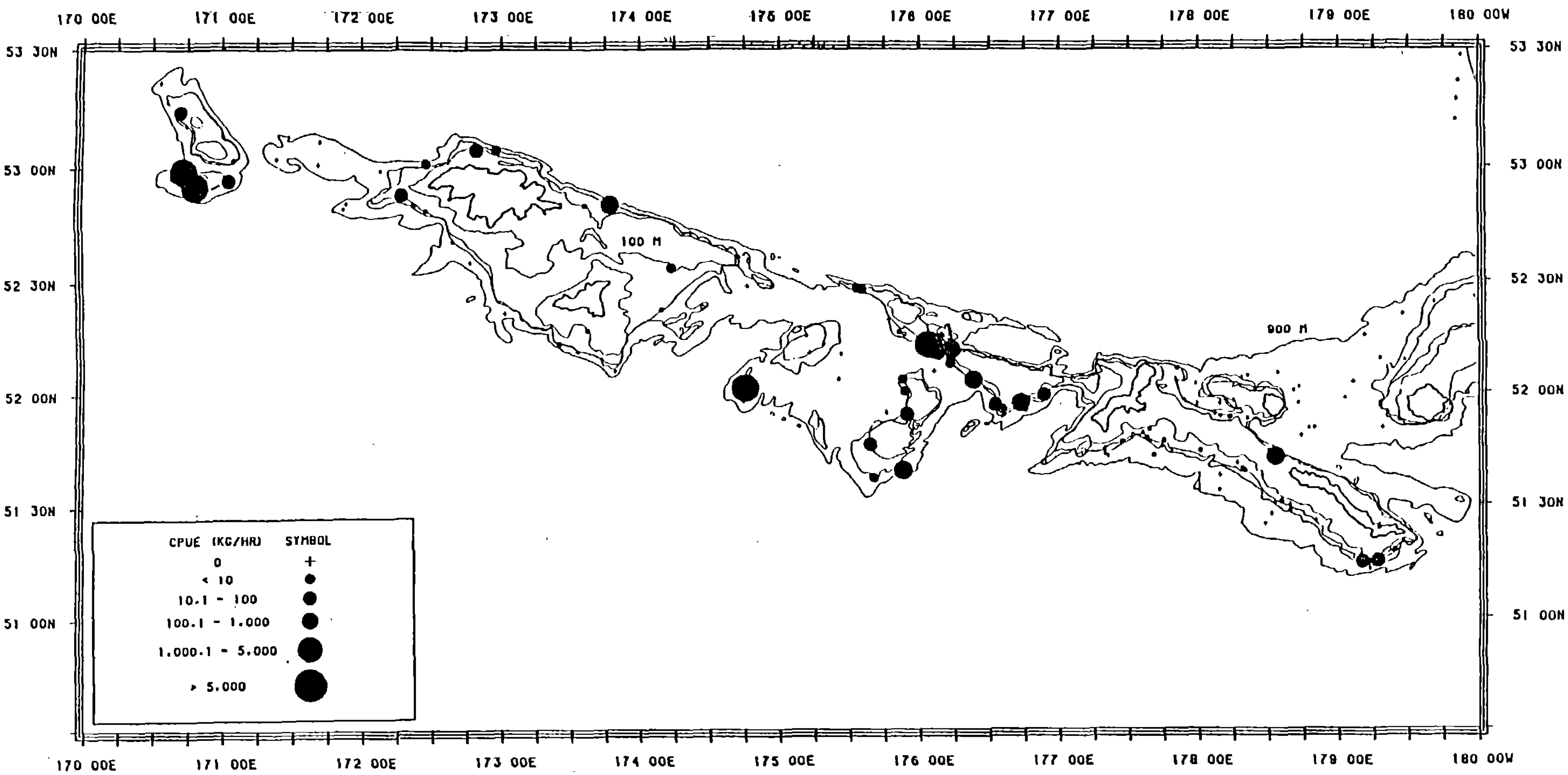

Figure 26. --Distribution and relative abundance of Atka mackerel in the southwest and northwest subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

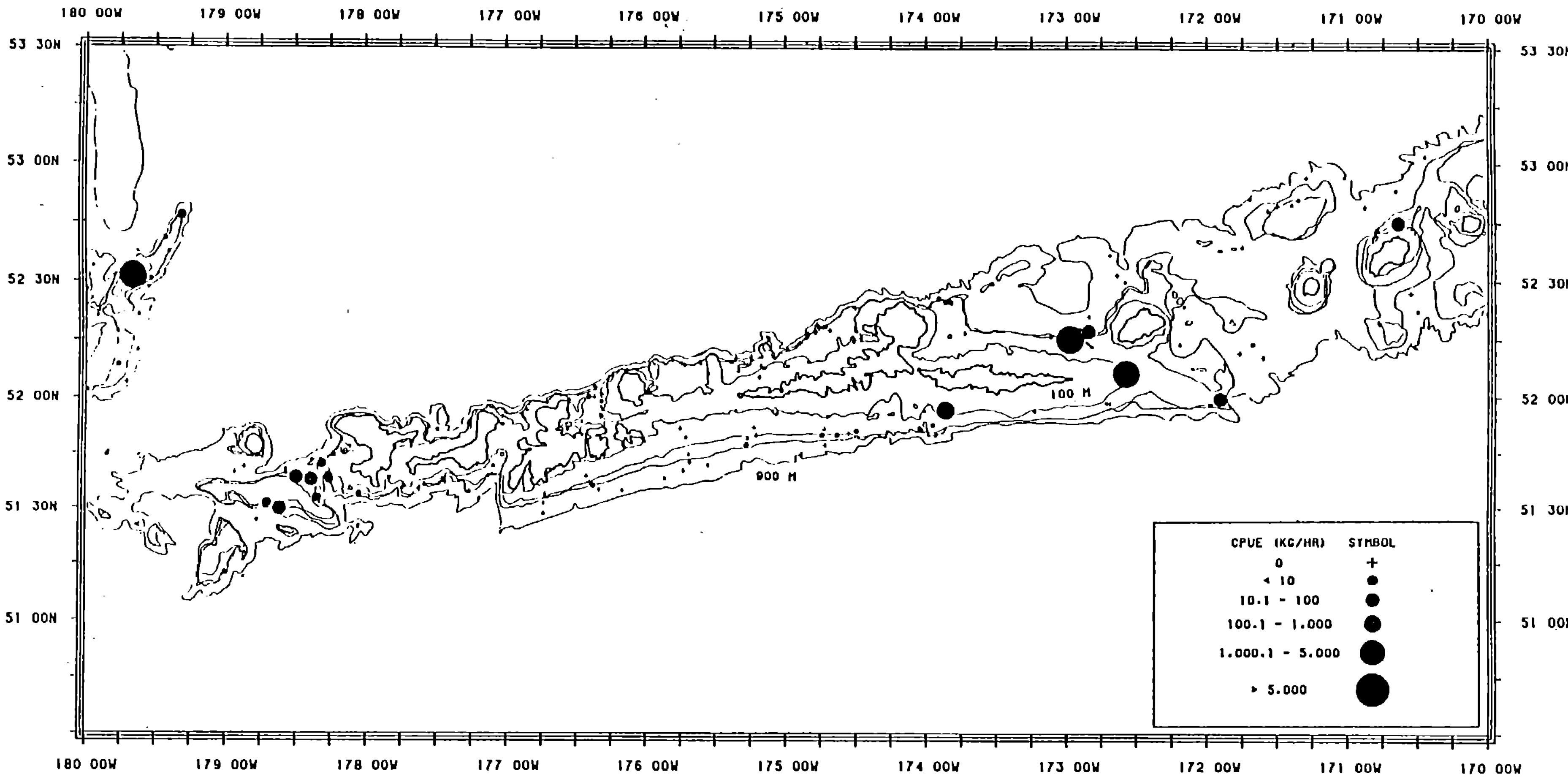

Figure 27.--Distribution and relative abundance of Atka mackerel in the southeast and northeast subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

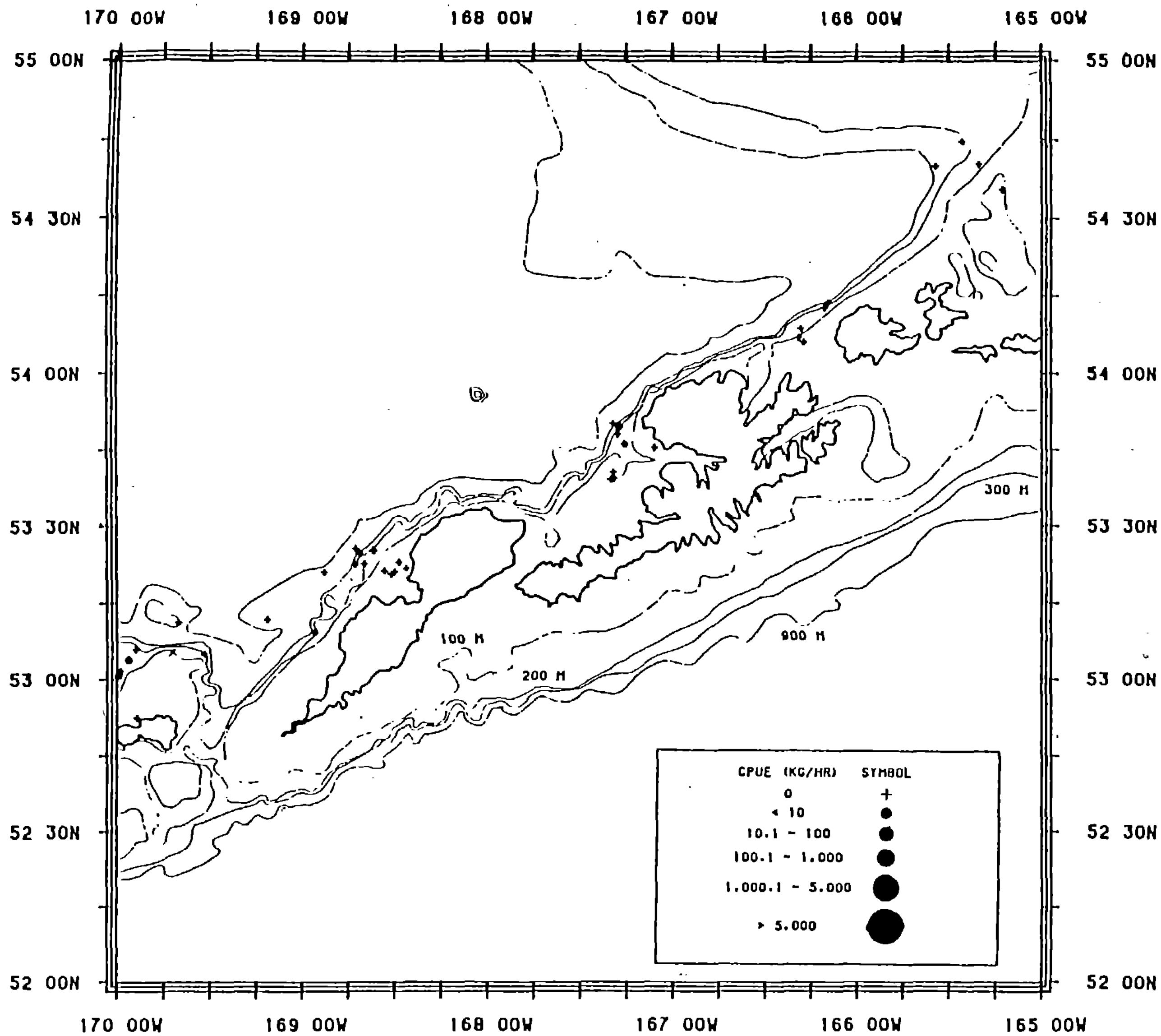

Figure 28. --Distribution and relative abundance of Atka mackerel in the southern Bering Sea subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

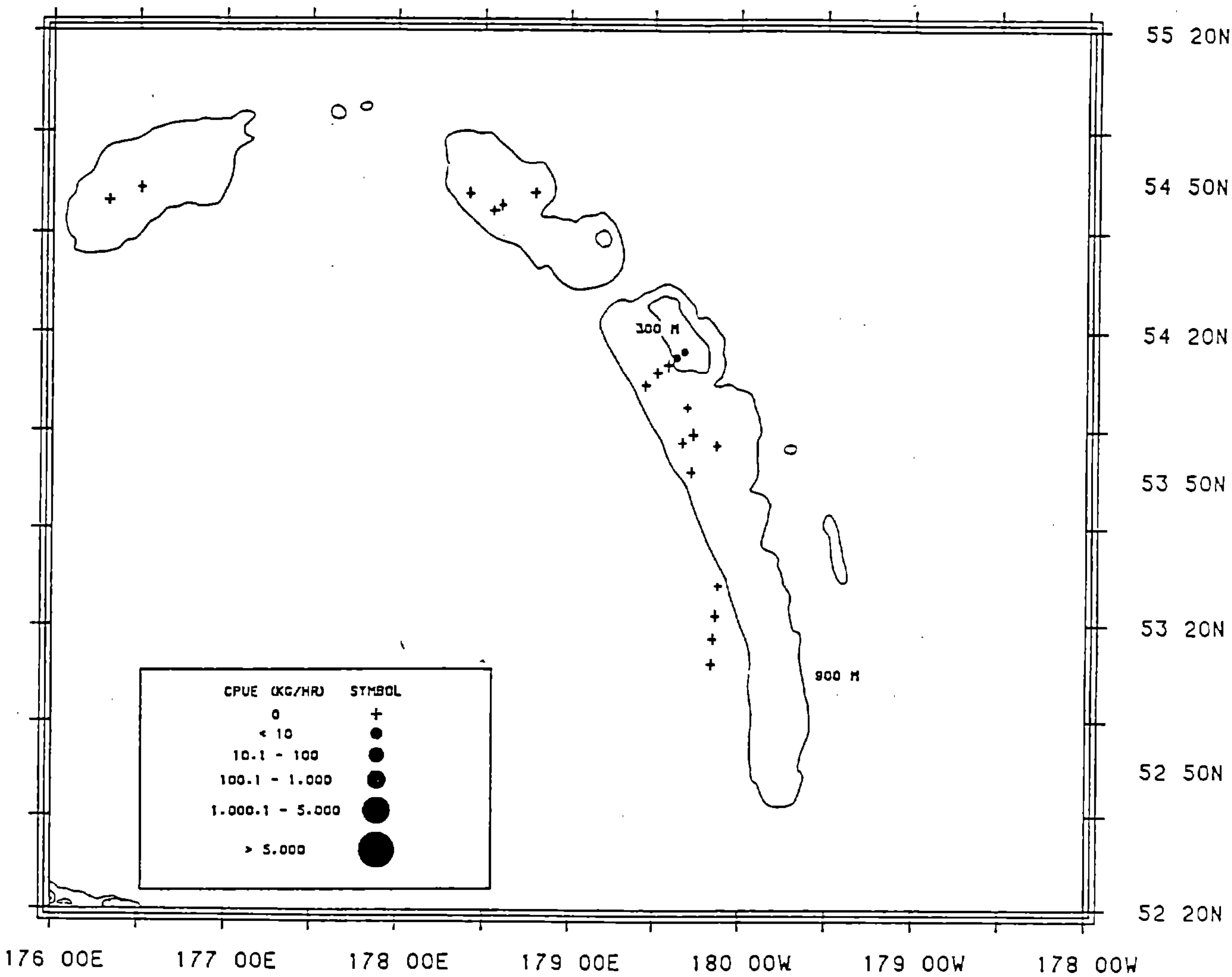

Figure 29. --Distribution and relative abundance of Atka mackerel in the Bowers Ridge subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

Table 15.--Mean CPUE (kg/h) and estimated biomass for Atka mackerel by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	1,312.5	140,552
		101-200	840.0	162,401
		201-300	31.9	3,656
		301-500	1.2	172
		501-900	0.0[a]	1
		1-900	359.5	306,782
	Southwest	1-100	629.2	15,321
		101-200	1,909.0	120,991
		201-300	115.5	2,304
		301-500	5.7	172
		501-900	0.0[a]	1
		1-900	673.7	138,789
	Southeast	1-100	2,191.9	65,814
		101-200	18.7	854
		201-300	6.7	202
		301-500	0.0	0
		501-900	0.0	0
		1-900	356.8	66,870
	Northwest	1-100	1,568.4	41,235
		101-200	176.4	5,571
		201-300	2.3	34
		301-500	0.0	0
		501-900	0.0	0
		1-900	281.3	46,840
	Northeast	1-100	788.9	18,182
		101-200	695.3	34,983
		201-300	33.8	1,116
		301-500	0.0	0
		501-900	0.0	0
		1-900	280.2	54,281
	Bowers Ridge	1-100	0.0[b]	0[b]
		101-200	0.7	2
		201-300	0.0	0
		301-500	0.0	0
		501-900	0.0	0
		1-900	0.0[b]	2
Bering Sea				
	Southern	1-100	0.0	0
		101-200	0.3	10
		201-300	0.0	0
		301-500	0.0	0
		501-900	0.0	0
		1-900	0.1	10

a/ Less than 0.1 kg/h.
b/ No sampling area available.

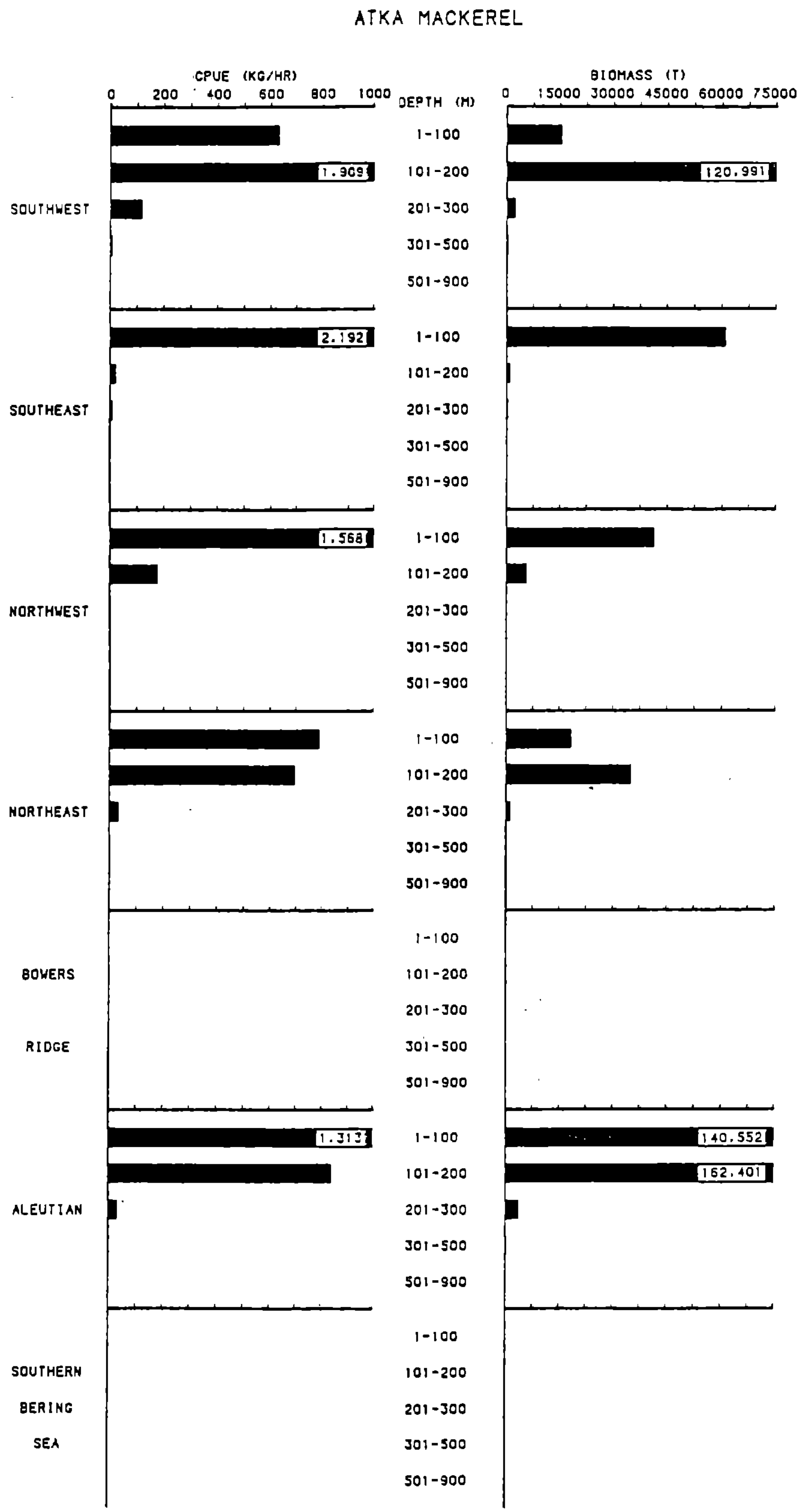

Figure 30.--Mean CPUE (kg/h) and estimated biomass (t) for Atka mackerel by area, subarea, and depth interval.

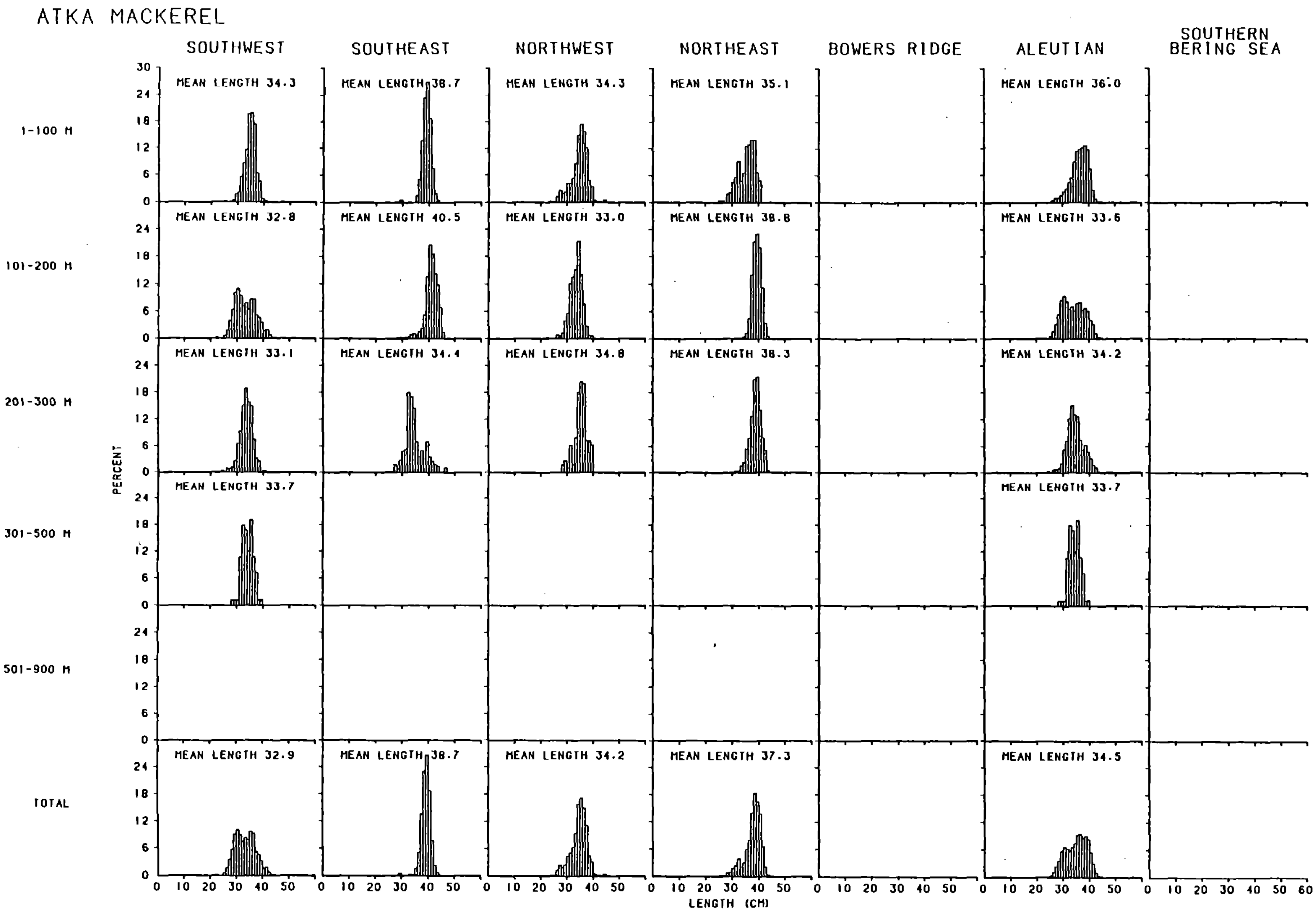

Figure 31 .--Size composition of Atka mackerel, sexes combined, by survey area, subarea, and depth zone.

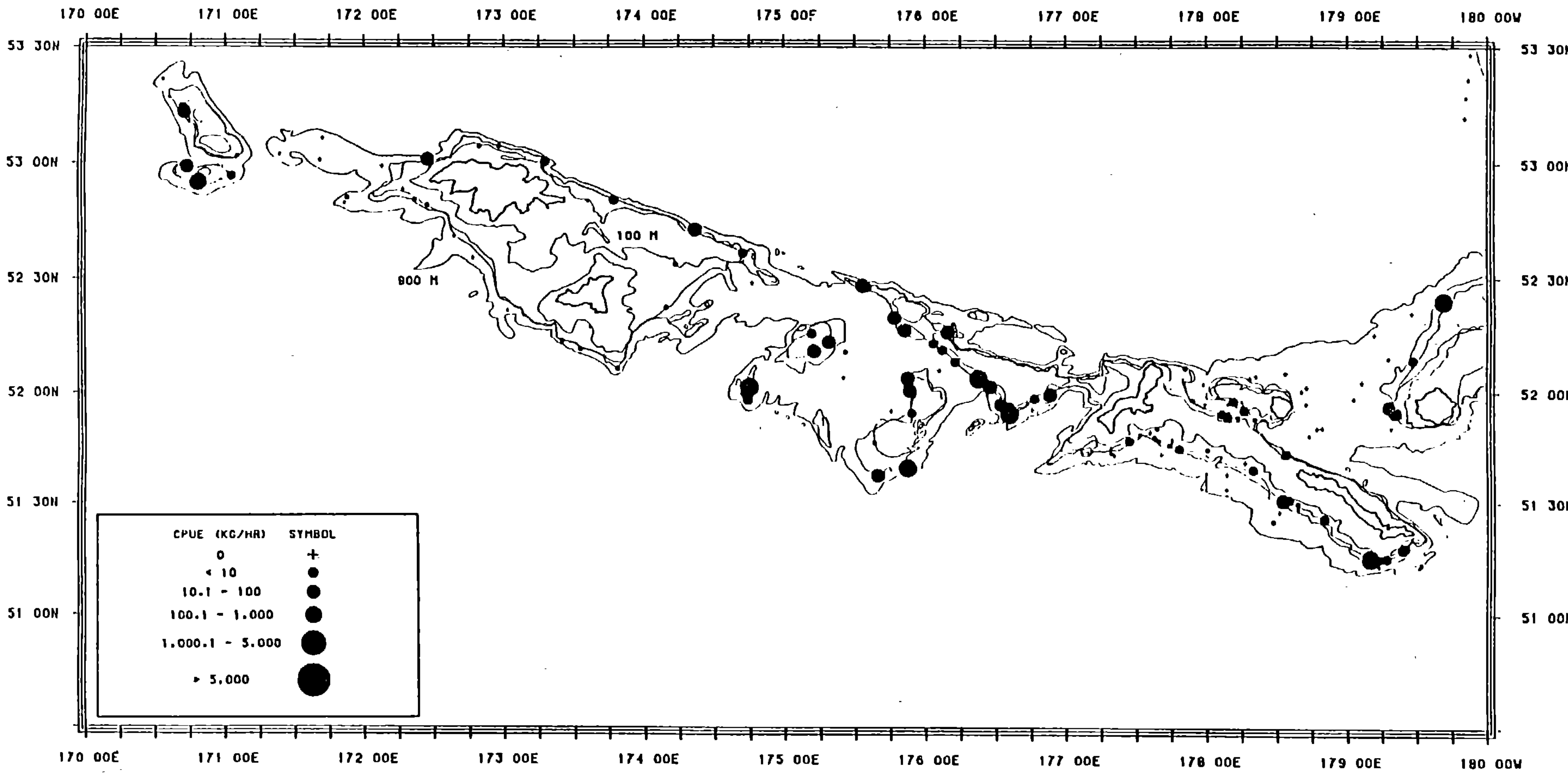

Figure 32.--Distribution and relative abundance of Pacific cod in the southwest and northwest subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

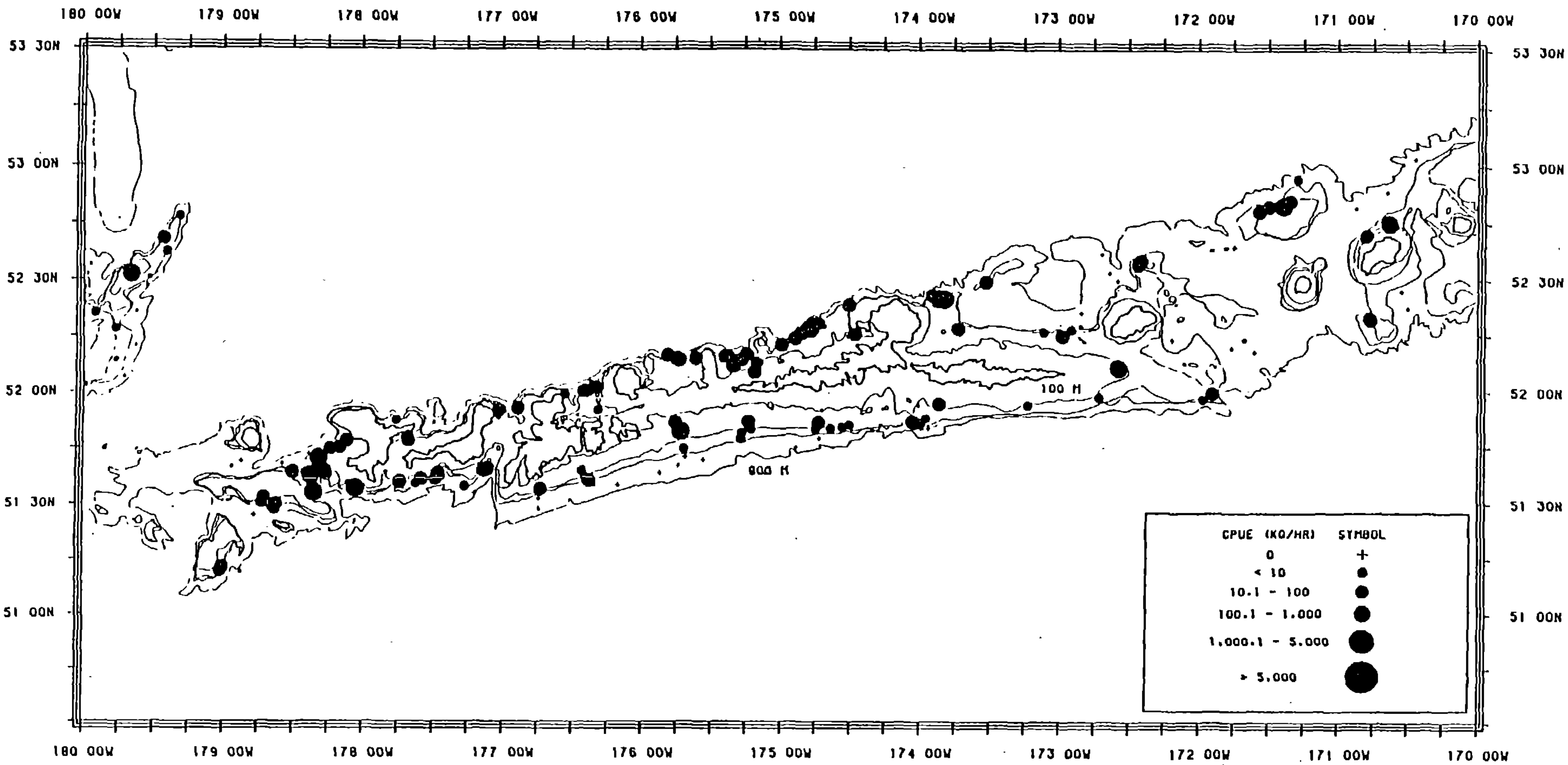

Figure 33. --Distribution and relative abundance of Pacific cod in the southeast and northeast subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

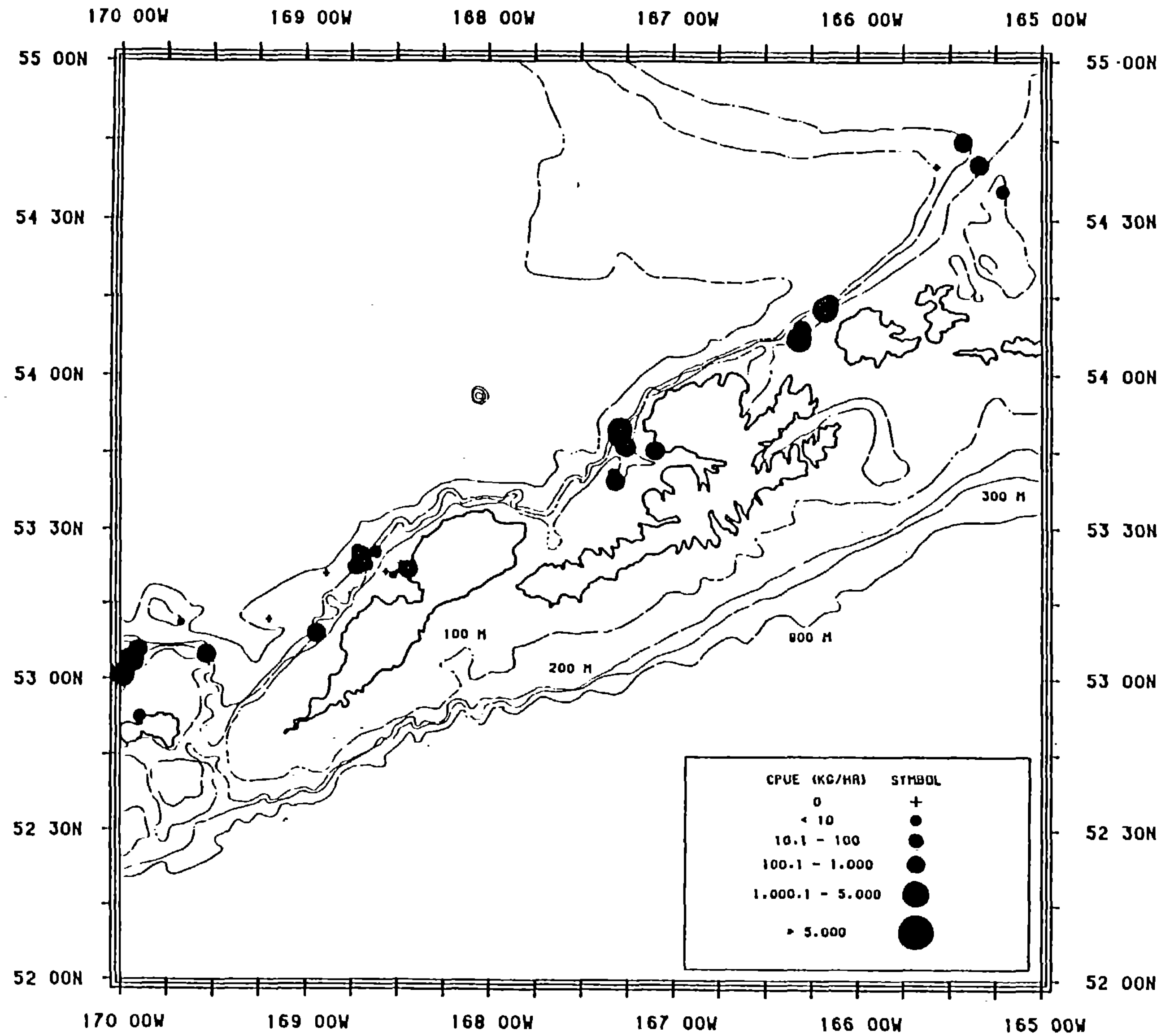

Figure 34.--Distribution and relative abundance of Pacific cod in the eastern Bering Sea subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

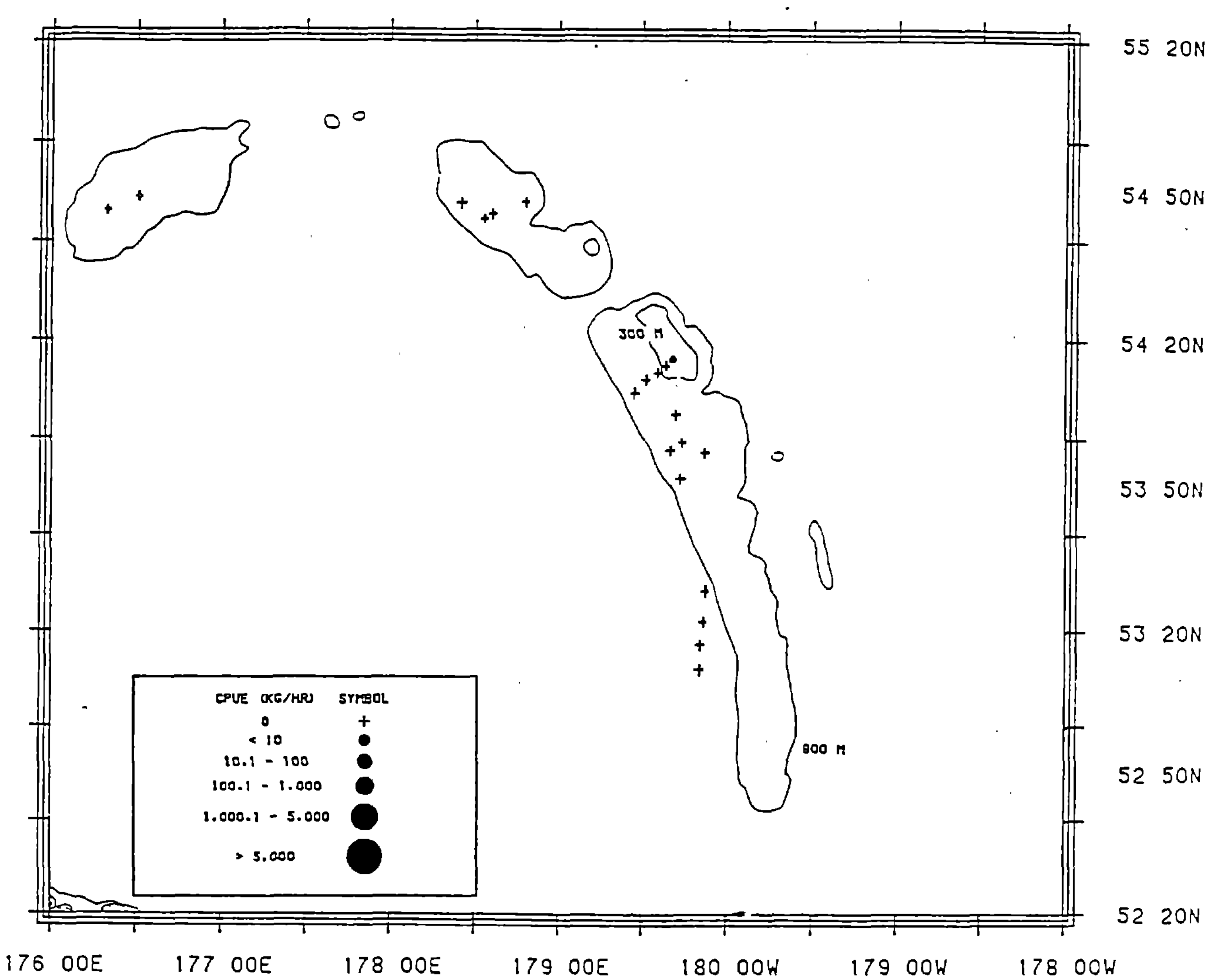

Figure 35. --Distribution and relative abundance of Pacific cod in the Bowers Ridge subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

southern Bering Sea (45,600 t), northwest (44,000 t), northeast (40,300 t), and the southeast (34,500 t) Aleutian Islands subareas (Table 16, Fig. 36).

The size composition of Pacific cod was similar in the southeast, northeast, and northwest subareas of the Aleutian Islands with most of the individuals being in the 50- to 80-cm size range (Fig. 37). Although smaller fish (less than 60 cm) were present in all areas of the Aleutian Islands area, a larger percentage of smaller fish were found in the southwest subarea. In the southern Bering Sea subarea a considerably larger percentage of the available population was in the 40- to 60-cm size range than in the Aleutian Islands area.

Pacific ocean perch (Sebastes alutus)

Pacific ocean perch were unevenly distributed throughout the survey area. In the southern Bering Sea subarea the distribution was very clumpy with dense concentrations -encountered off Makushin Bay and Inanudak Bay, and northeast of the Islands of Four Mountains (Figs. 38-41). In the eastern portion of the Aleutian Islands largest concentrations were found at Atka and Amlia Islands, particularly on the south side of the islands. In the western Aleutian Islands largest concentrations were found on the south side of Tahoma and Buldir Reefs.

The highest density, 738 kg/h, was found in the southern Bering Sea subarea which also contained an estimated biomass of 97,500 t (Table 17, Fig. 42). Seventy-five percent of the total estimated biomass of the Aleutian Islands area (144,100 t) was contained in two subareas: the southeast (66,000 t) and the southwest (42,400 t). Depth intervals containing the highest CPUE values differed between subareas. While Pacific ocean perch occurred at the highest mean catch rate between 100 and 300 m, the highest

Table 16.--Mean CPUE (kg/h) and estimated biomass (t) of Pacific cod by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	382.7	43,832
		101-200	382.5	75,420
		201-300	150.8	17,046
		301-500	4.3	589
		501-900	0.0	0
		1-900	155.4	136,887
	Southwest	1-100	343.4	8,427
		101-200	134.8	8,855
		201-300	41.2	817
		301-500	1.2	30
		501-900	0.0	0
		1-900	92.2	18,129
	Southeast	1-100	235.5	7,137
		101-200	429.8	20,934
		201-300	179.1	6,218
		301-500	5.0	172
		501-900	0.0	0
		1-900	177.5	34,461
	Northwest	1-100	541.5	17,287
		101-200	841.7	22,774
		201-300	308.9	3,946
		301-500	0.2	3
		501-900	0.0	0
		1-900	268.4	44,010
	Northeast	1-100	459.9	10,981
		101-200	418.0	22,856
		201-300	179.6	6,065
		301-500	10.5	384
		501-900	0.0	0
		1-900	191.9	40,286
	Bowers Ridge	1-100	0.0 a/	0 a/
		101-200	0.5	1
		201-300	0.0	0
		301-500	0.0	0
		501-900	0.0 b/	0
		1-900	0.0	1
Bering Sea				
	Southern	1-100	222.5	11,121
		101-200	899.3	29,864
		201-300	414.6	4,236
		301-500	29.8	403
		501-900	0.0	0
		1-900	353.5	45,624

a/ No sampling area available.
b/ Less than 0.1 kg/h.

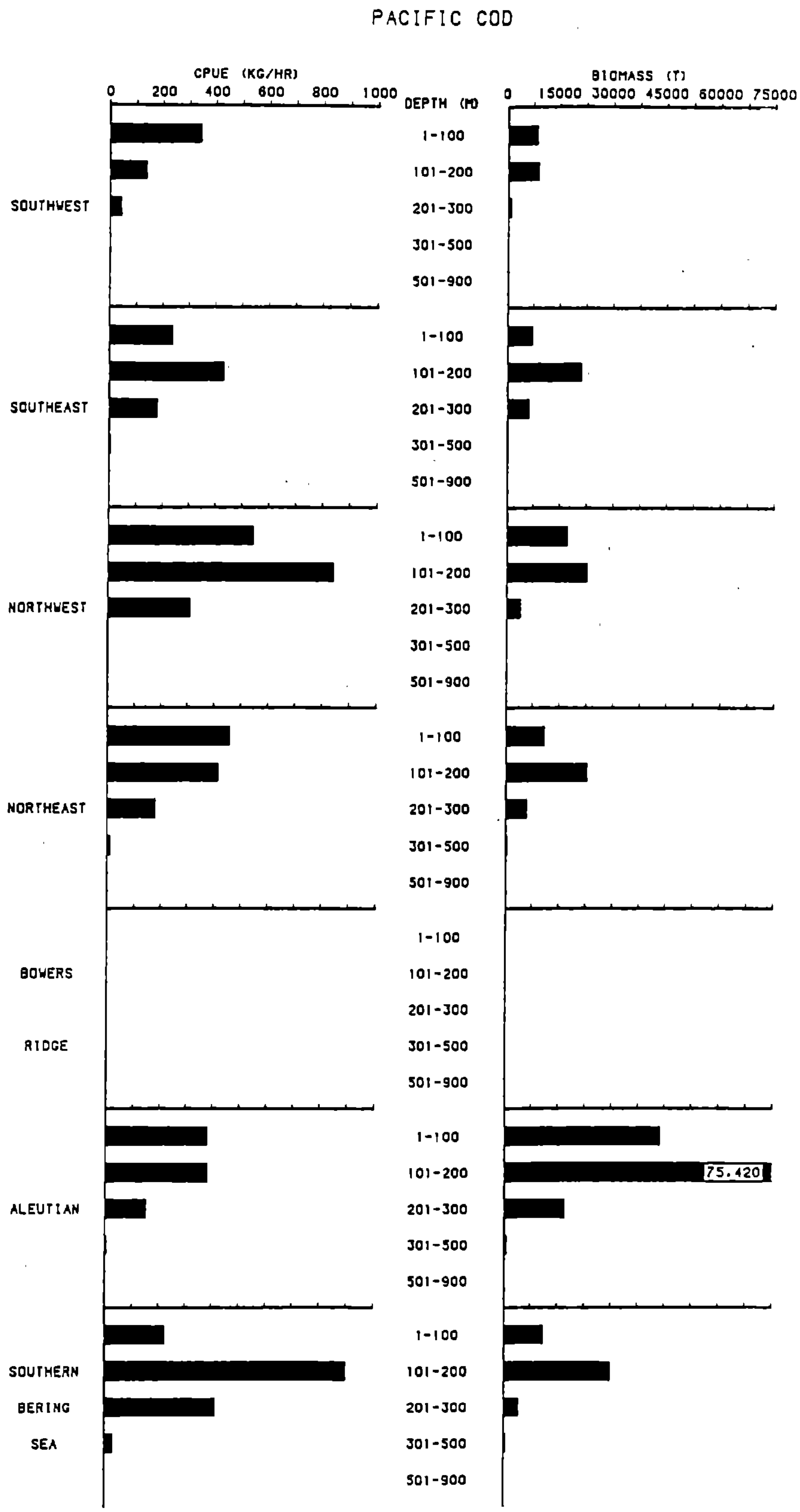

Figure 36. --Mean CPUE (kg/h) and estimated biomass (t) of Pacific cod by area, subarea, and depth interval.

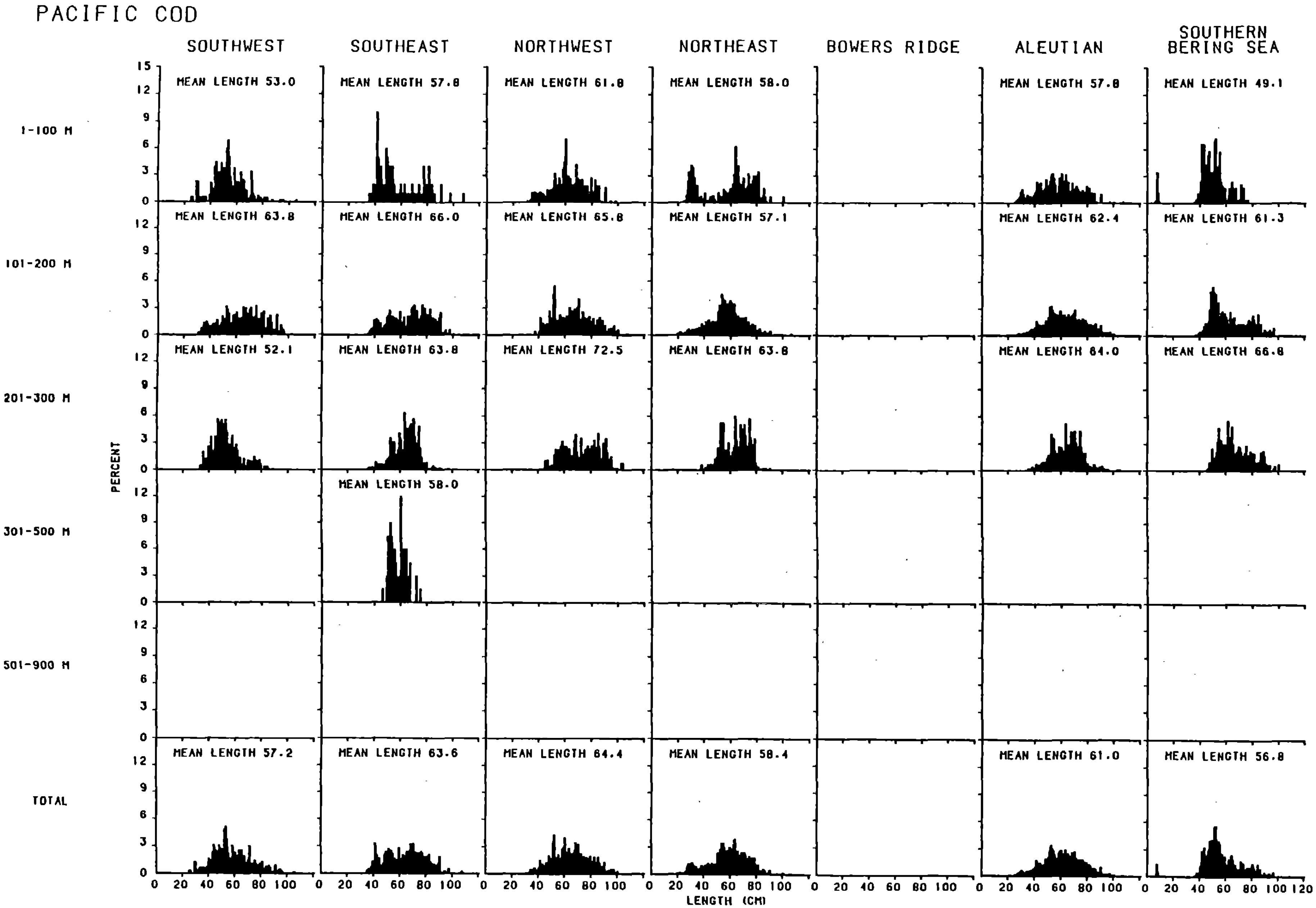

Figure 37. --Size composition of Pacific cod, sexes combined, by survey area, subarea, and depth zone.

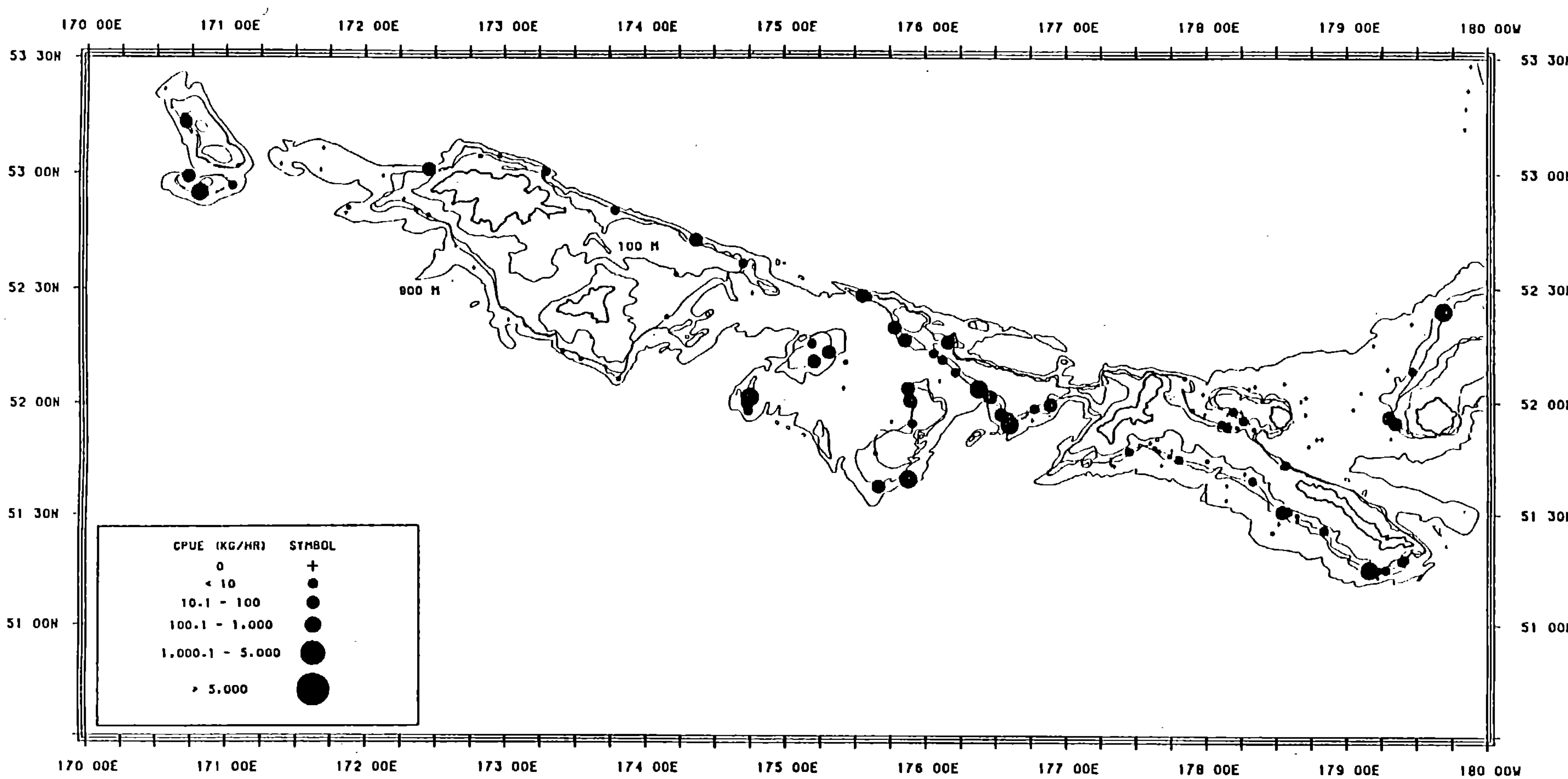

Figure 38.--Distribution and relative abundance of Pacific ocean perch in the southwest and northwest subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

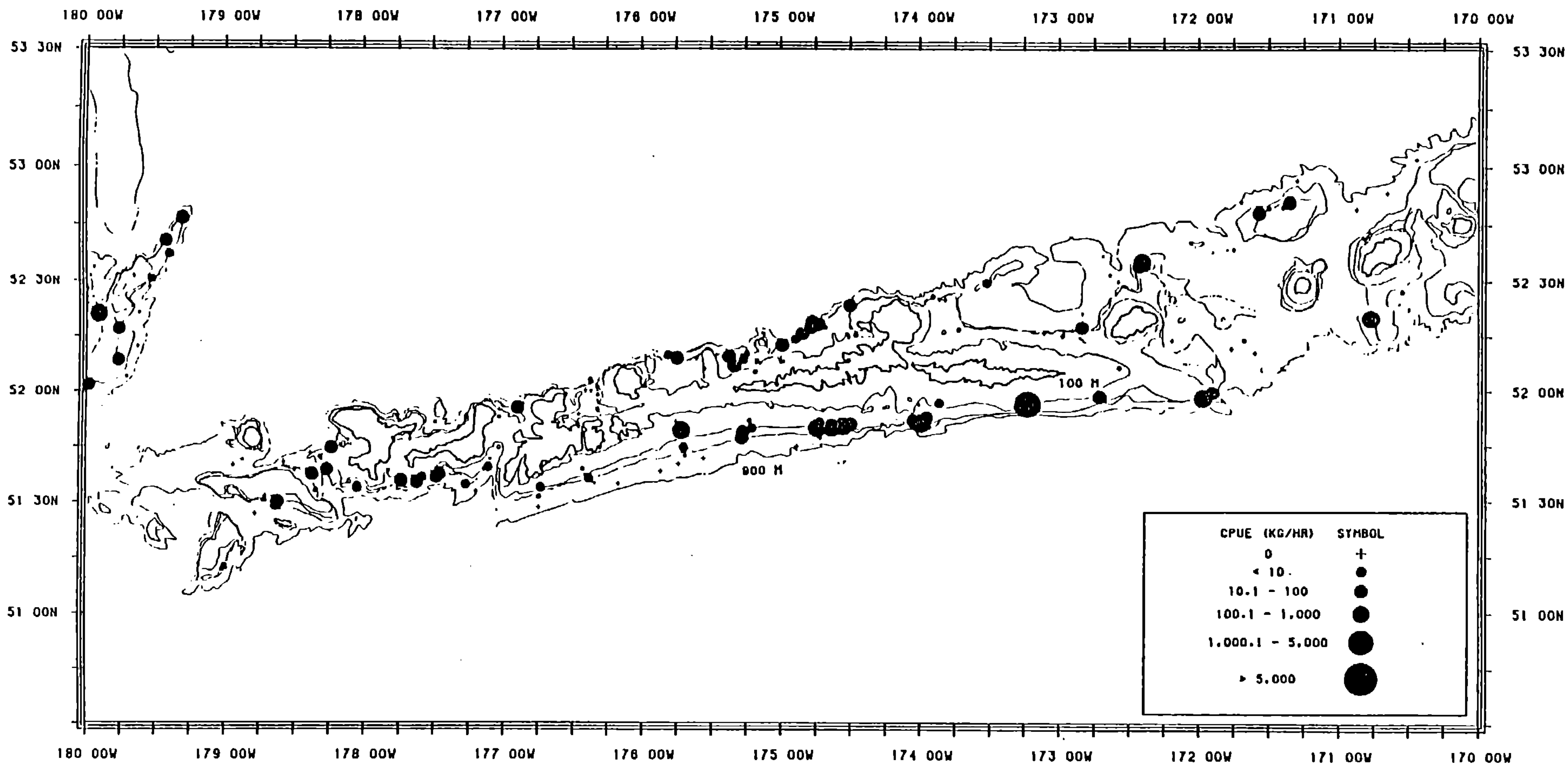

Figure 39. --Distribution and relative abundance of Pacific ocean perch in the northeast and southeast subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

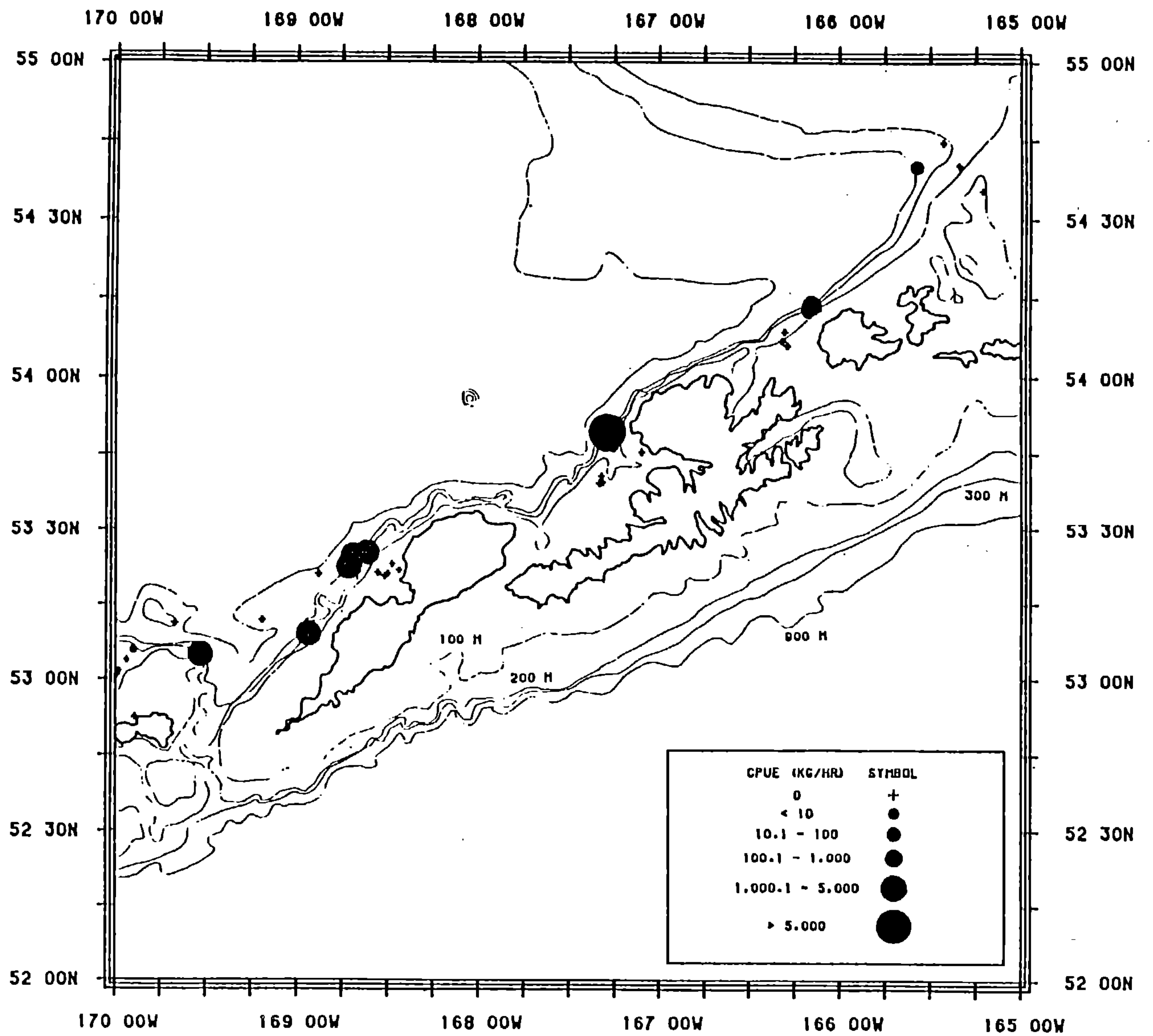

Figure 40. --Distribution and relative abundance of Pacific ocean perch in the southern Bering Sea subarea during the 1983 cooperative U.S.-Japan Aleutian Island survey,

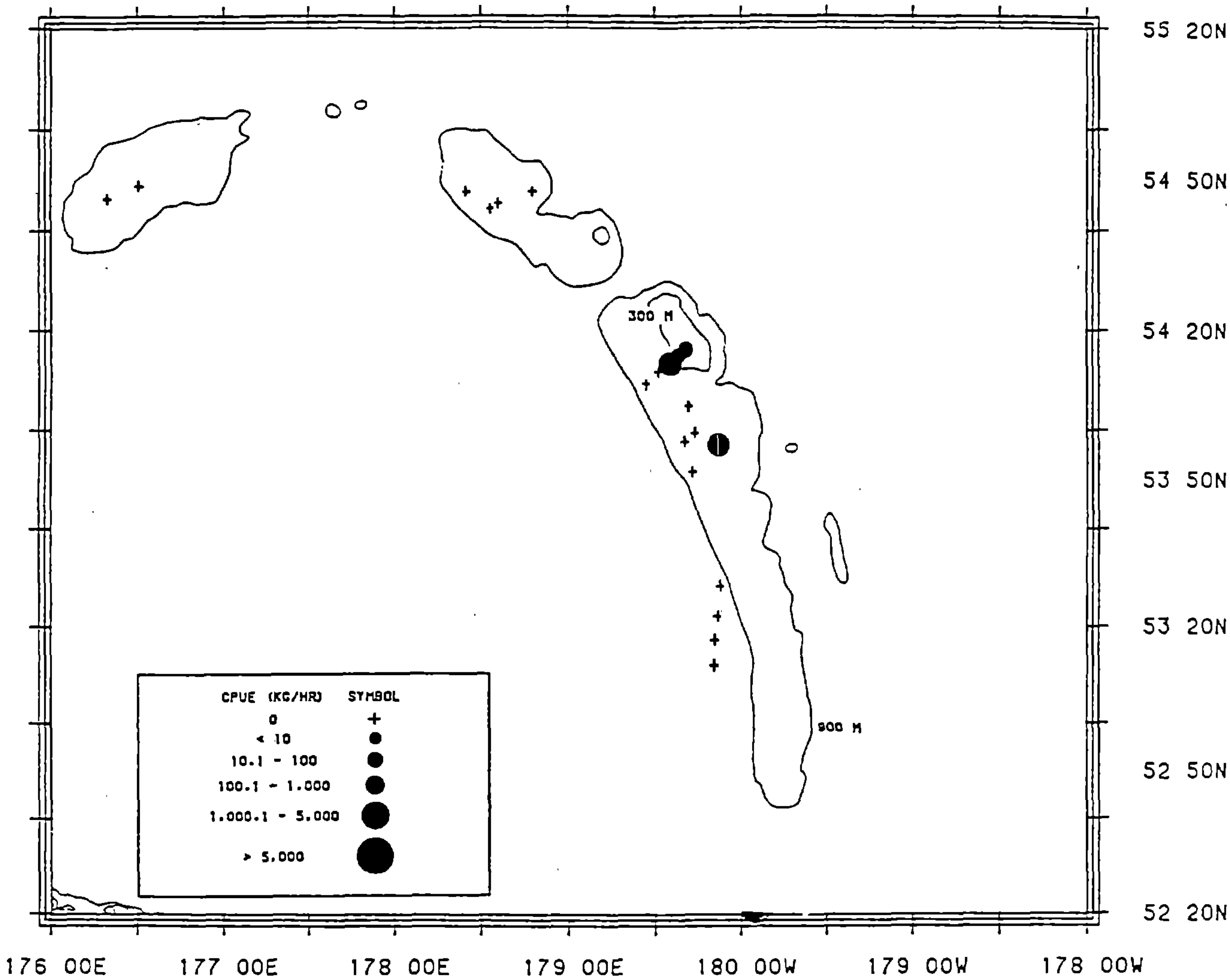

Figure 41. --Distribution and relative abundance of Pacific ocean perch in the Bowers Ridge subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

Table 17.--Mean CPUE (kg/h) and estimated biomass for Pacific ocean perch by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	6.3	710
		101-200	399.6	76,634
		201-300	618.5	66,063
		301-500	5.4	666
		501-900	0.0 a/	6
		1-900	174.8	144,079
	Southwest	1-100	0.1	3
		101-200	608.6	37,169
		201-300	267.3	5,181
		301-500	2.1	67
		501-900	0.0 a/	2
		1-900	209.7	42,422
	Southeast	1-100	21.6	694
		101-200	538.9	26,064
		201-300	1,148.1	39,003
		301-500	6.7	230
		501-900	0.0	0
		1-900	367.4	65,991
	Northwest	1-100	0.2	5
		101-200	27.8	748
		201-300	281.2	3,067
		301-500	0.5	12
		501-900	0.0	0
		1-900	29.4	3,832
	Northeast	1-100	0.3	8
		101-200	248.3	12,527
		201-300	363.6	12,753
		301-500	12.3	357
		501-900	0.1	4
		1-900	119.3	25,649
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	46.3	126
		201-300	478.6	6,059
		301-500	0.0	0
		501-900	0.0	0
		1-900	58.4	6,185
Bering Sea				
	Southern	1-100	0.0	0
		101-200	2,293.1	78,190
		201-300	1,580.1	16,638
		301-500	192.8	2,651
		501-900	0.0	0
		1-900	738.3	97,479

a/ Less than 0.1 kg/h.
b/ No sampling area available.

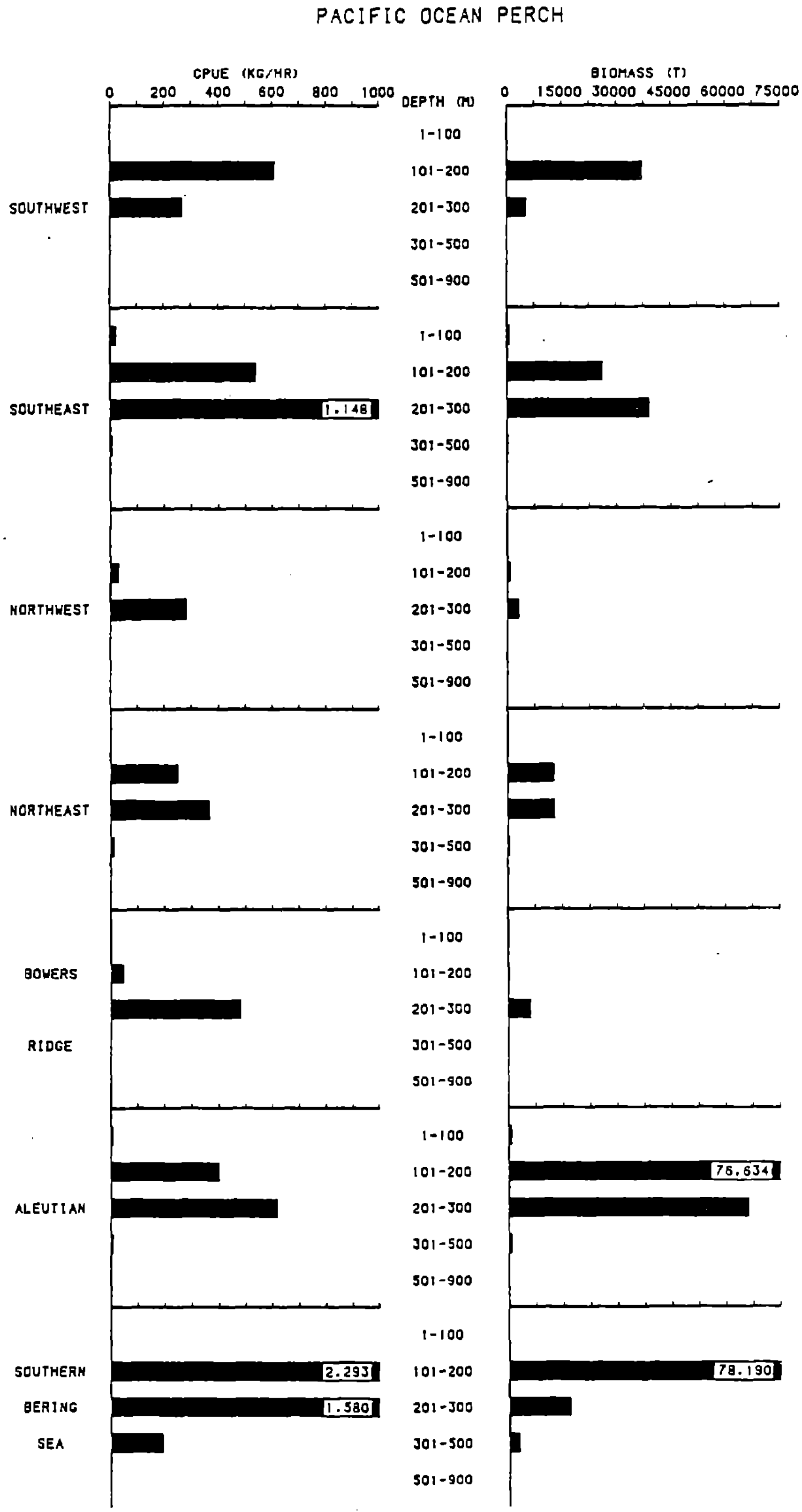

Figure 42.--Mean CPUE (kg/h) and estimated biomass for Pacific ocean perch by area, subarea, and depth interval.

catch rates were between 101 and 200 m in the southern Bering Sea subarea but were highest between 201 and 300 m in the Aleutian Islands subareas.

With the exception of the Bowers Ridge subarea, the size composition within the survey area showed similarity in that the majority of the population was in the 25- to 35-cm size range (Fig. 43). The southwest contained a lower percentage of larger fish than the other subareas and the Bowers Ridge subarea contained a lower proportion of smaller fish.

Sablefish (Anoplopoma fimbria)

Sablefish were found throughout the survey area with the highest abundance in the eastern portion of the Aleutian Islands (Figs. 44-47). Highest densities were encountered in the northeast subarea (208 kg/h) and the highest mean catch rate by depth in the Aleutian Islands subareas occurred in the deepest depth strata sampled, 501-900 m (Table 18, Fig. 48). In the southern Bering Sea subarea, however, the highest density by depth was encountered in the 301- to 500-m interval. Over 68% of the estimated biomass for the Aleutian Islands subareas was located in the northeast subarea and nearly 90% was estimated from the two eastern Aleutian subareas.

The size composition of sablefish was similar throughout the survey area with the exception of the Bowers Ridge subarea where there were very few individuals smaller than 60 cm and the principal mode occurred from approximately 60-80 cm (Fig. 49). In the other subareas the majority of the population ranged from 50 to 75 cm.

Other Rockfish

Four other species of rockfish, the northern, shortraker, rougheye, and shortspine thornyhead, occur throughout the survey area. Although they are not as widely distributed or in as high abundance as the dominant species, they do

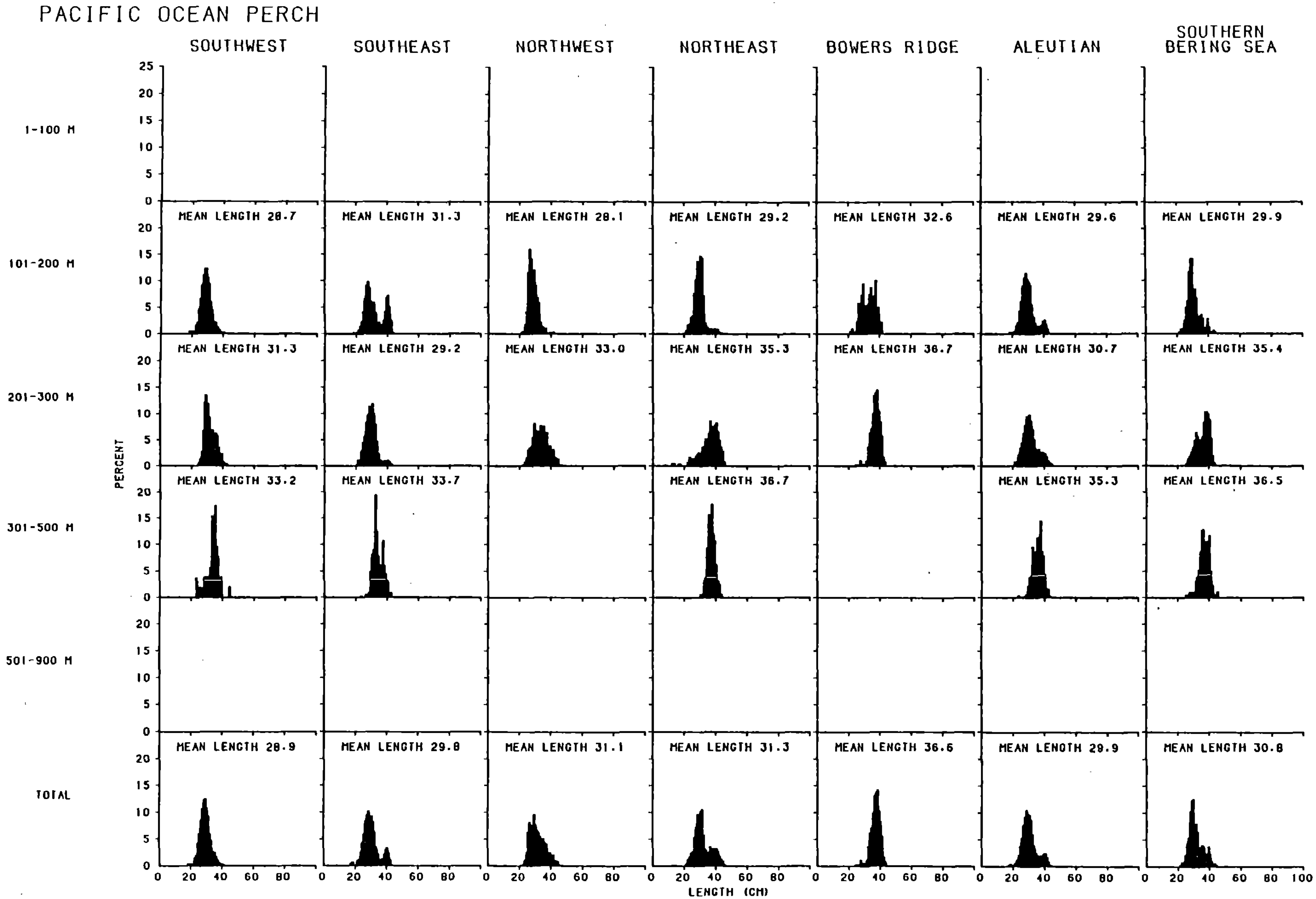

Figure 43. --Size composition of Pacific ocean perch, sexes combined, by survey area, subarea, and depth zone.

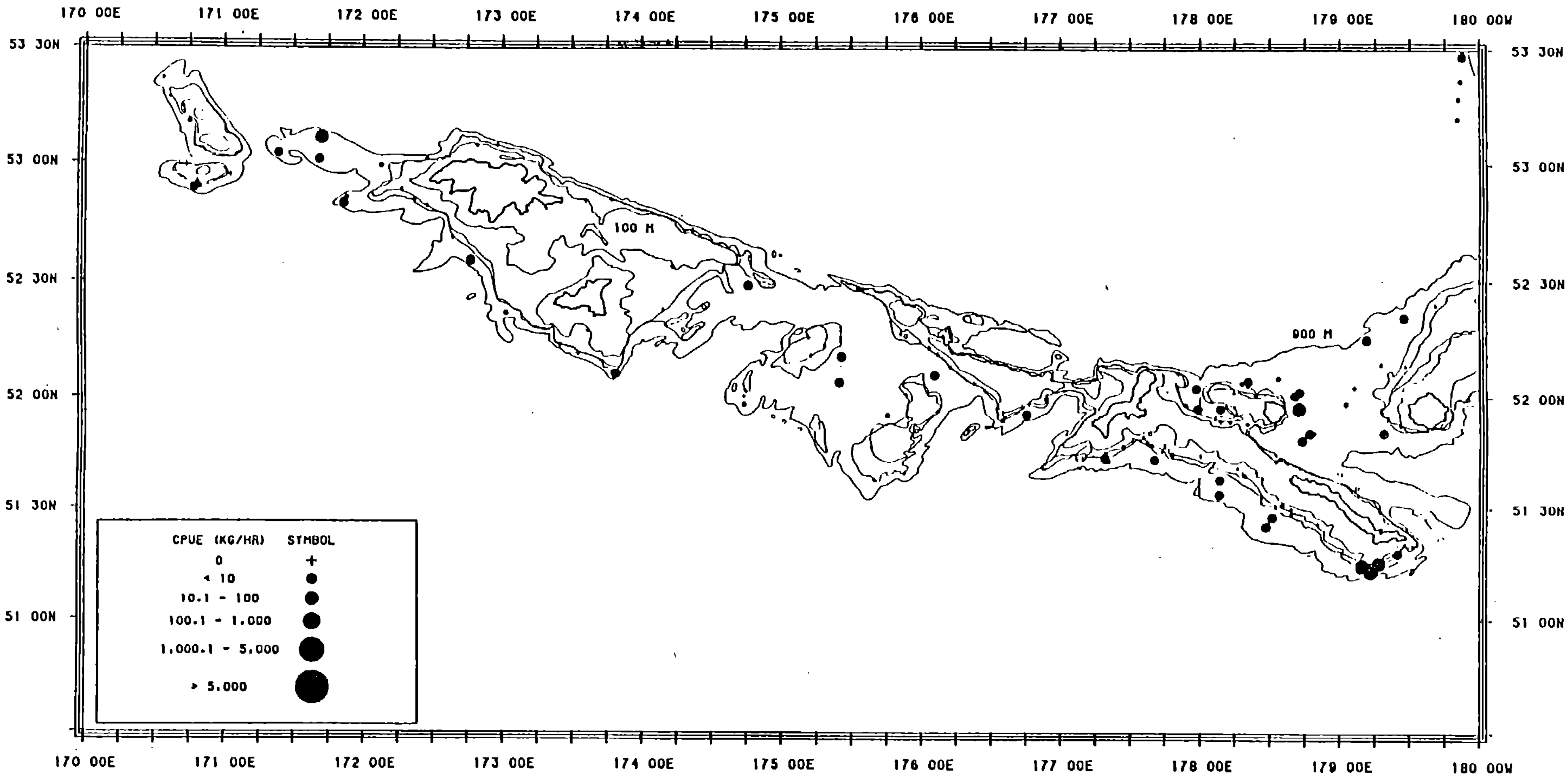

Figure 44.--Distribution and relative abundance of sablefish in the southwest and northwest subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

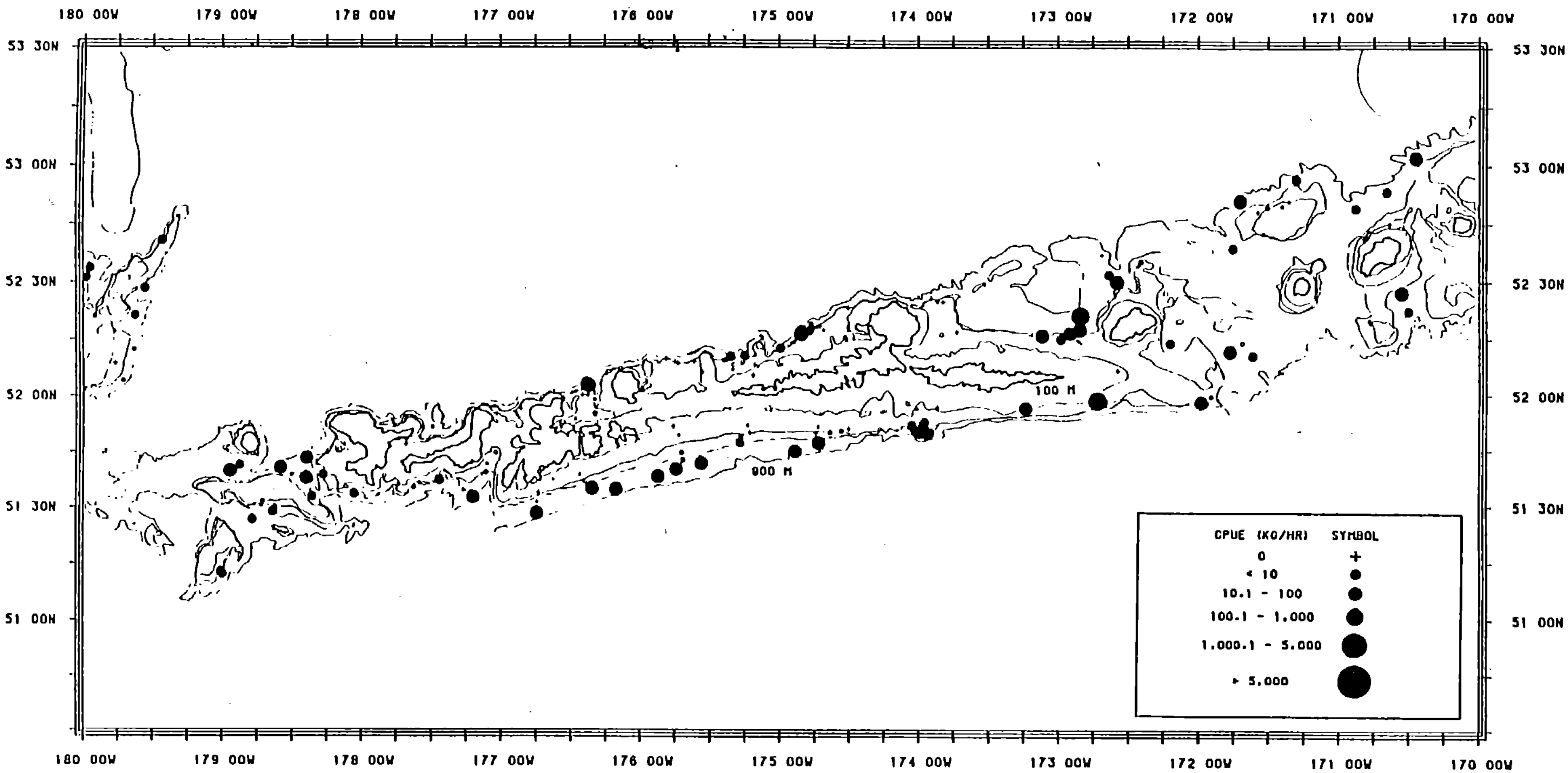

Figure 45.--Distribution and relative abundance of sablefish in the southeast and northeast subareas of the Aleutian region during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

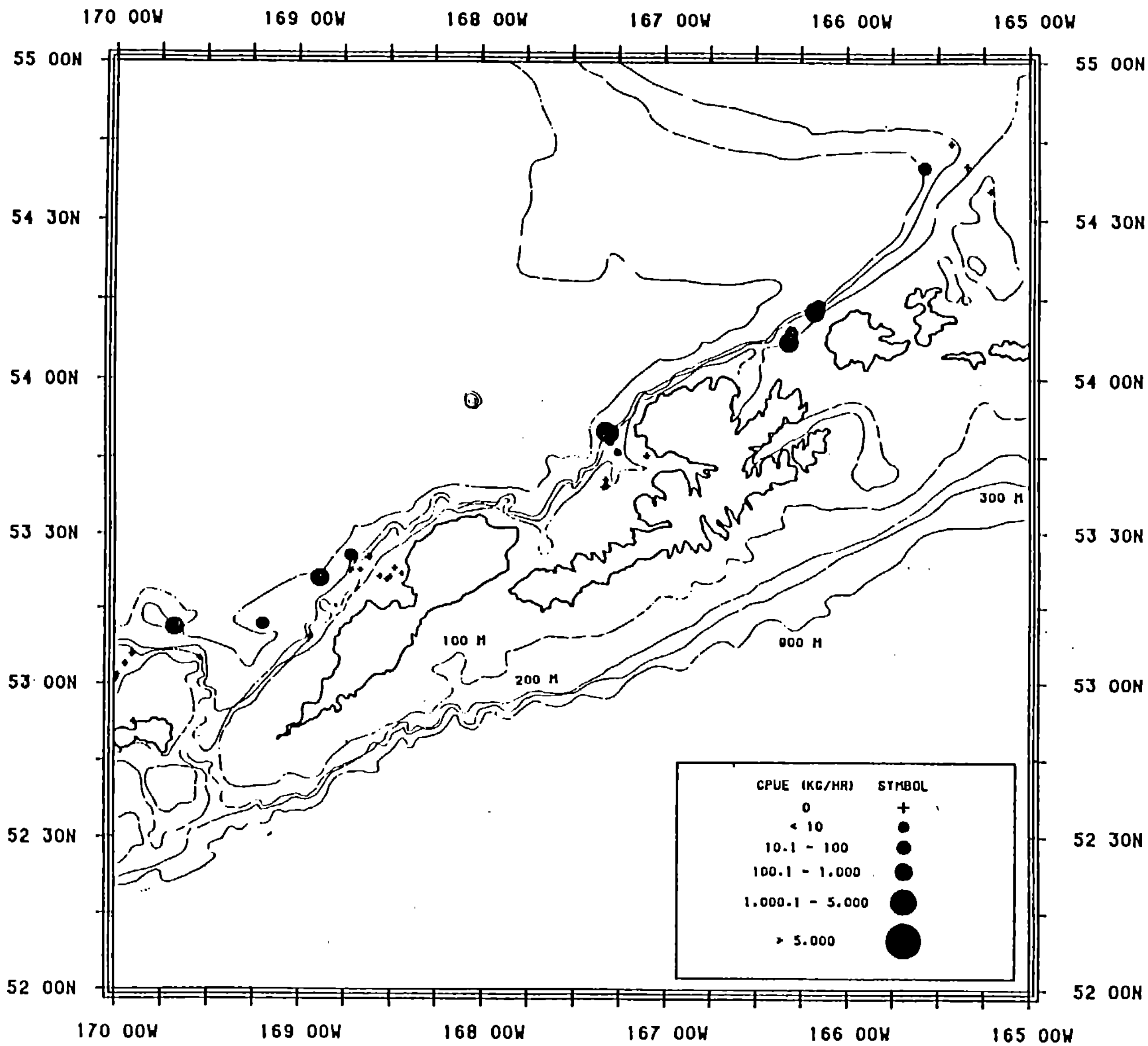

Figure 46. --Distribution and relative abundance of sablefish in the southern Bering Sea subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

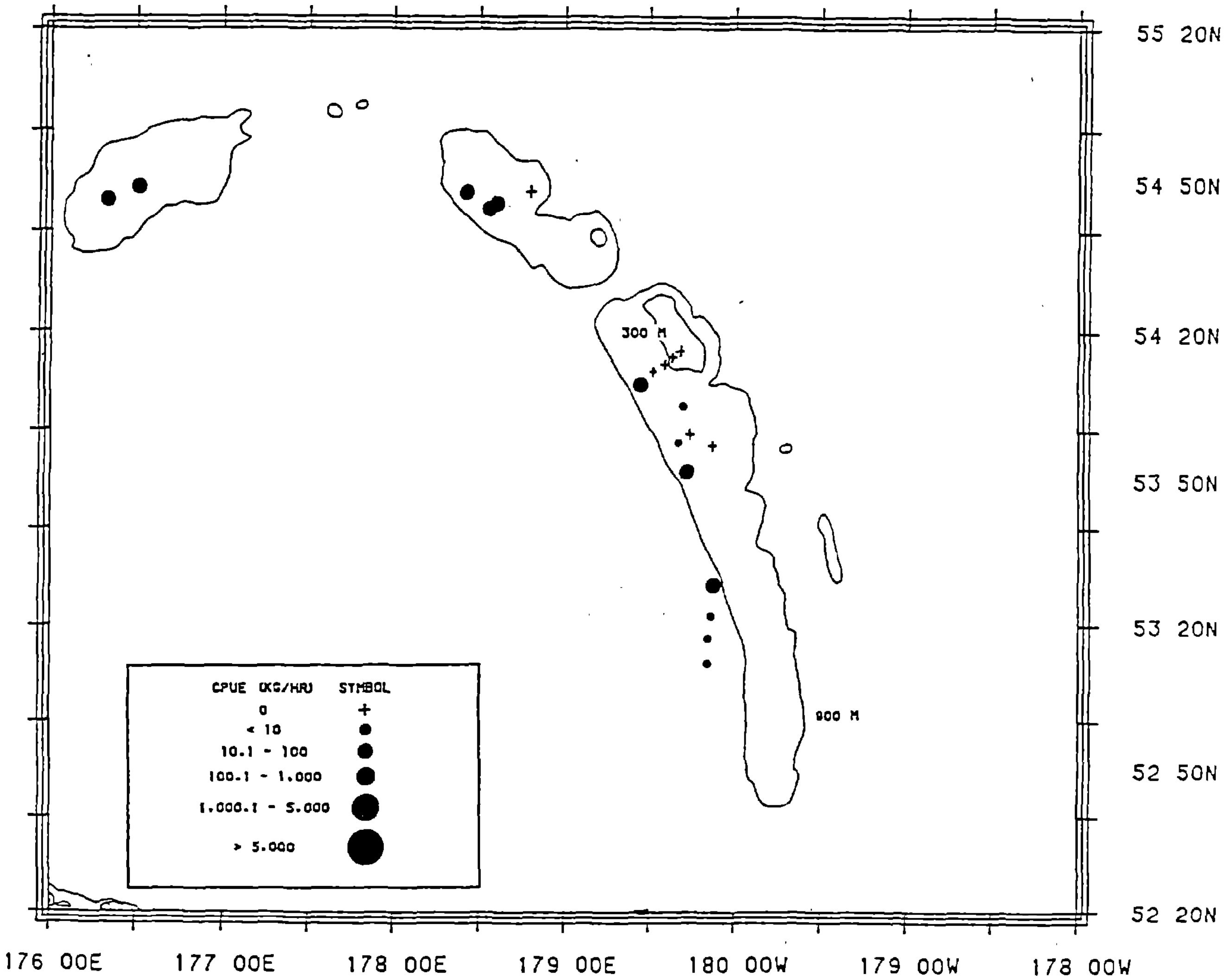

Figure 47 .--Distribution and relative abundance of sablefish in the Bowers Ridge subarea during the 1983 cooperative U.S.-Japan Aleutian Islands survey.

Table 18.--Mean CPUE (kg/h) and estimated biomass (t) for sablefish by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.0	0
		101-200	35.0	6,473
		201-300	47.9	5,391
		301-500	71.1	9,679
		501-900	147.6	47,000
		1-900	77.4	68,543
	Southwest	1-100	0.0	0
		101-200	4.2	244
		201-300	12.8	245
		301-500	8.9	266
		501-900	41.4	2,813
		1-900	16.8	3,568
	Southeast	1-100	0.0	0
		101-200	10.7	465
		201-300	60.6	1,909
		301-500	148.5	4,995
		501-900	172.1	7,000
		1-900	78.9	14,369
	Northwest	1-100	0.0	0
		101-200	0.0[a]	0
		201-300	0.0[a]	2
		301-500	38.9	1,046
		501-900	21.5	1,429
		1-900	15.1	2,477
	Northeast	1-100	0.0	0
		101-200	109.5	5,764
		201-300	91.5	3,235
		301-500	91.3	3,180
		501-900	498.6	34,938
		1-900	207.8	47,117
	Bowers Ridge	1-100	0.0[b]	0[b]
		101-200	0.0	0
		201-300	0.0	0
		301-500	12.2	192
		501-900	12.1	820
		1-900	10.3	1,012
Bering Sea				
	Southern	1-100	14.1	704
		101-200	43.8	1,453
		201-300	15.4	174
		301-500	241.7	2,851
		501-900	212.0	4,689
		1-900	80.4	9,871

a/ Less than 0.1 kg/h.
b/ No sampling area available.

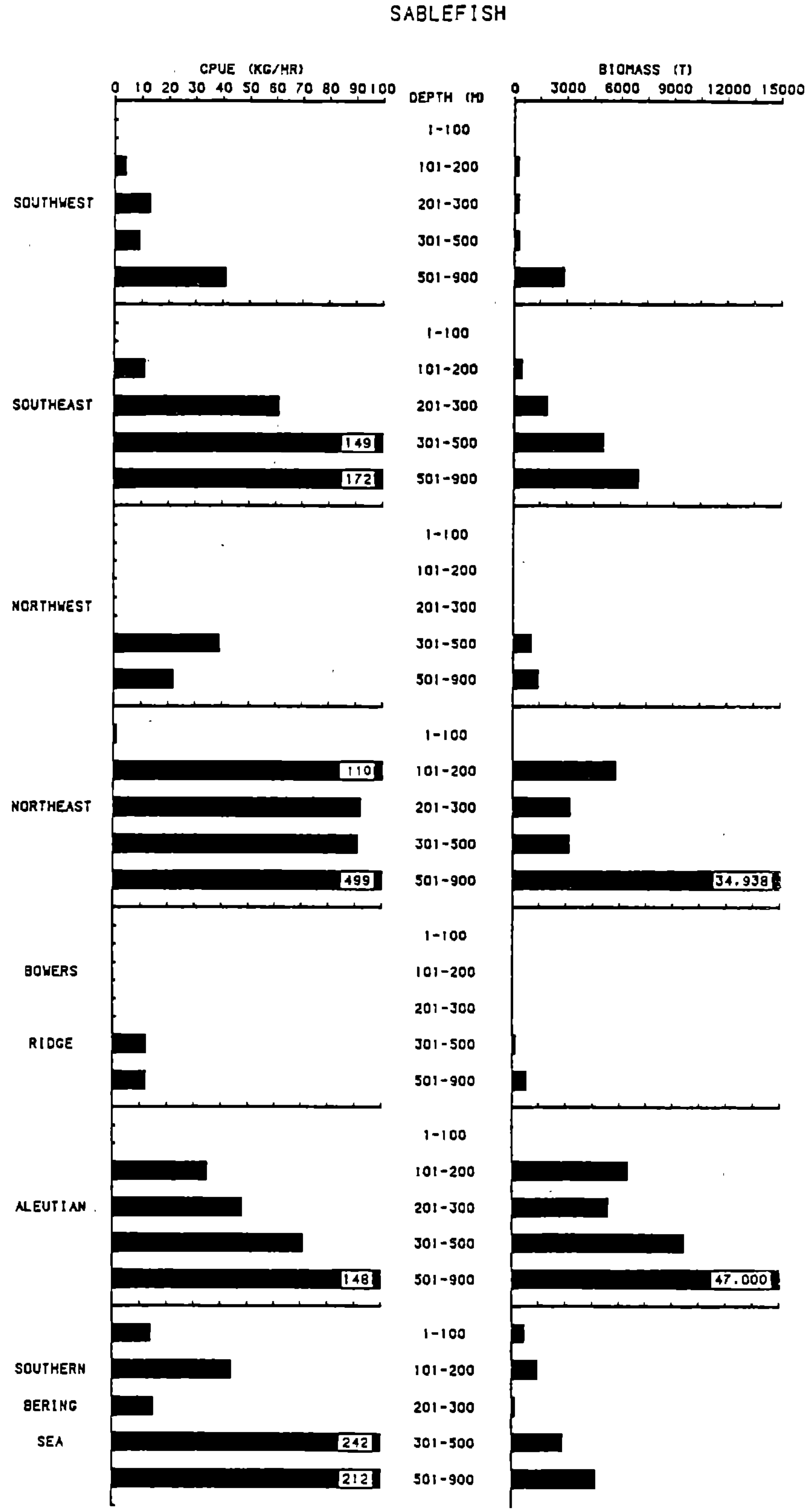

Figure 48.--Mean CPUE (kg/h) and estimated biomass (t) for sablefish by area, subarea, and depth interval.

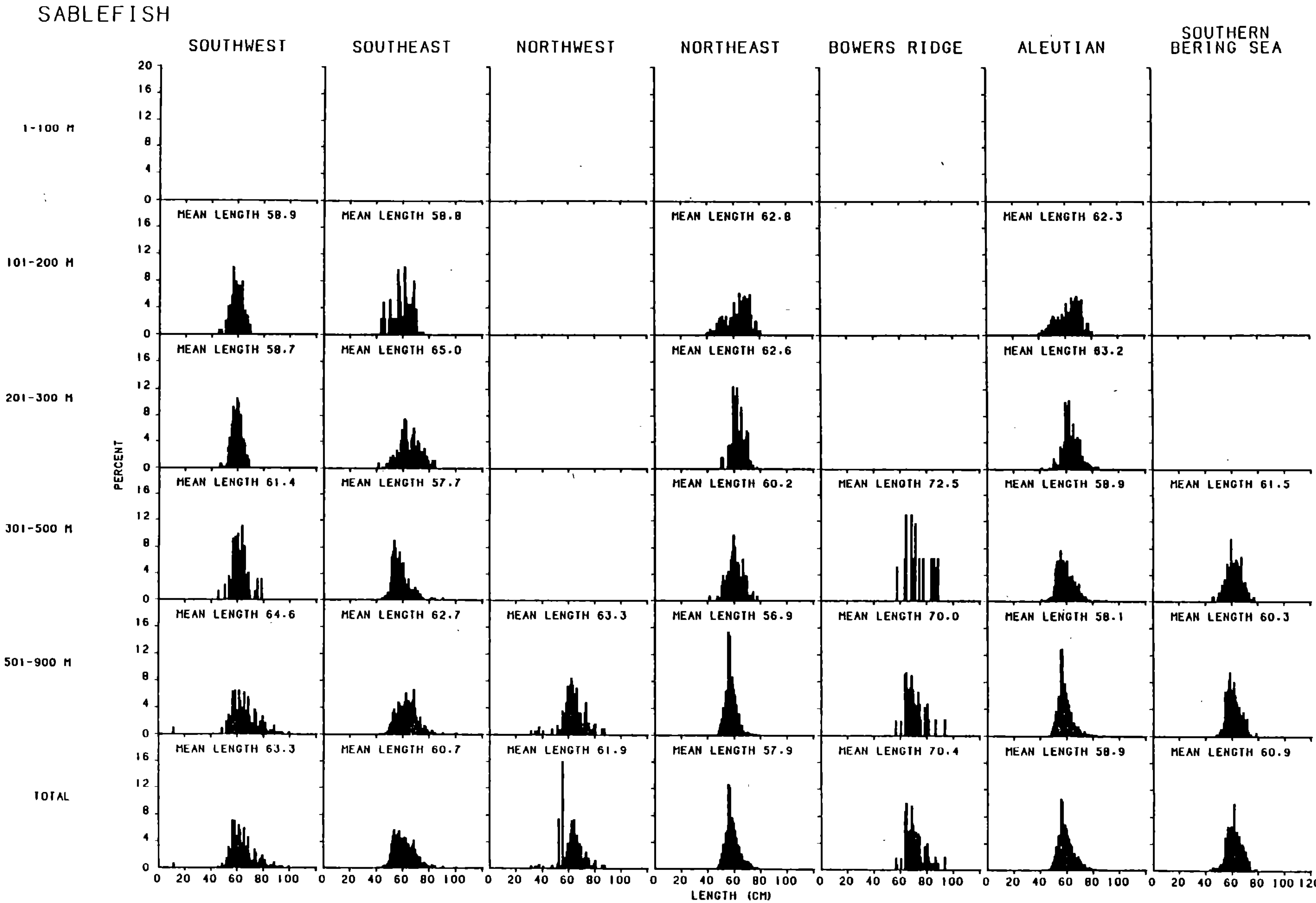

Figure 49.--Size composition of sablefish, sexes combined, by survey area, subarea, and depth zone.

occur at levels which will support harvesting in certain areas of the Aleutian Islands and the southern Bering Sea.

Northern rockfish (*Sebastes polyspinis*)--Northern rockfish were primarily distributed in the western Aleutian Islands subareas and in the shallowest depth interval sampled where the mean catch rates averaged 308 kg/h in the southwest, 265 kg/h in the northwest, and 263 kg/h in the southeast subareas (Table 19). These three subareas contain nearly 93% of the total biomass estimate of 44,500 t for the Aleutian Islands subareas, and the l- to 100-m depth interval contained over 63% of the total (Fig. 50).

Northern rockfish ranged in size from approximately 25 to 35 cm (Fig. 51). In most subareas, the size composition curve peaked near 30 cm; however, in the southeast subarea, there was a strong showing of smaller fish (peak mode at approximately 24 cm).

Shortraker rockfish (*Sebastes borealis*)--Shortraker rockfish were relatively evenly distributed throughout the survey area but occurred in higher abundance in the southern Bering Sea and the northeast Aleutian Islands subareas. The mean catch rate in the southern Bering Sea subarea (101 kg/h) was nearly double that of the highest mean catch rate in the Aleutian Islands subareas (the northeast subarea with 52 kg/h), as shown in Table 20. The estimated biomass was more evenly distributed between subareas: 13,100 t for the southern Bering Sea and 10,800 t for the northeast subarea. Throughout the survey area shortraker rockfish were by far most abundant in the 301- to 500-m depth interval (Fig. 52).

The size composition of shortraker rockfish was found to be quite different between survey subareas (Fig. 53). In the southern subareas the majority of the specimens were small, less than 50 cm with a principal mode below 40 cm. In the subareas north of the island chain, mean length increased

Table 19.--Mean CPUE (kg/h) and estimated biomass for northern rockfish by area, subarea, and depth-interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	249.7	28,746
		101-200	81.5	14,816
		201-300	5.1	535
		301-500	2.3	361
		501-900	0.0	0
		1-900	51.0	44,458
	Southwest	1-100	308.1	8,061
		101-200	125.5	7,552
		201-300	10.6	172
		301-500	8.4	300
		501-900	0.0	0
		1-900	82.6	16,085
	Southeast	1-100	263.8	7,934
		101-200	81.2	2,924
		201-300	3.0	117
		301-500	2.0	59
		501-900	0.0	0
		1-900	62.5	11,034
	Northwest	1-100	424.8	12,362
		101-200	54.3	1,604
		201-300	19.2	231
		301-500	0.0	0
		501-900	0.0	0
		1-900	79.0	14,197
	Northeast	1-100	16.8	389
		101-200	31.4	1,732
		201-300	0.5	15
		301-500	0.0 a/	2
		501-900	0.0	0
		1-900	10.2	2,138
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	336.4	1,004
		201-300	0.0	0
		301-500	0.0	0
		501-900	0.0	0
		1-900	10.2	1,004
Bering Sea				
	Southern	1-100	0.0	0
		101-200	45.2	1,439
		201-300	8.4	77
		301-500	0.0	0
		501-900	0.0	0
		1-900	12.4	1,516

a/ Less than 0.05 kg/h.
b/ No sampling area available.

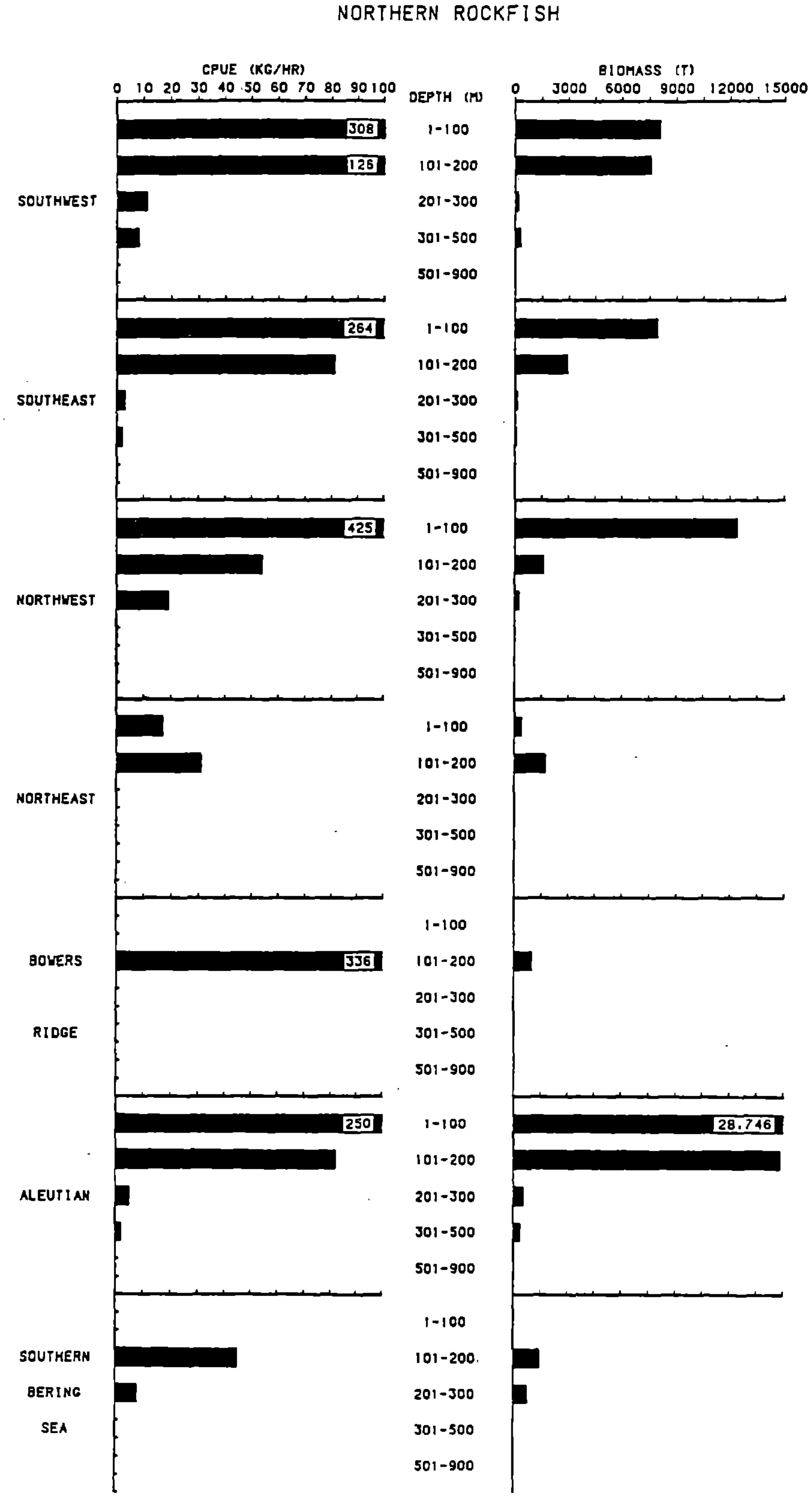

Figure 50.--Mean CPUE (kg/h) and estimated biomass (t) for northern rockfish by area, subarea, and depth interval.

NORTHERN ROCKFISH

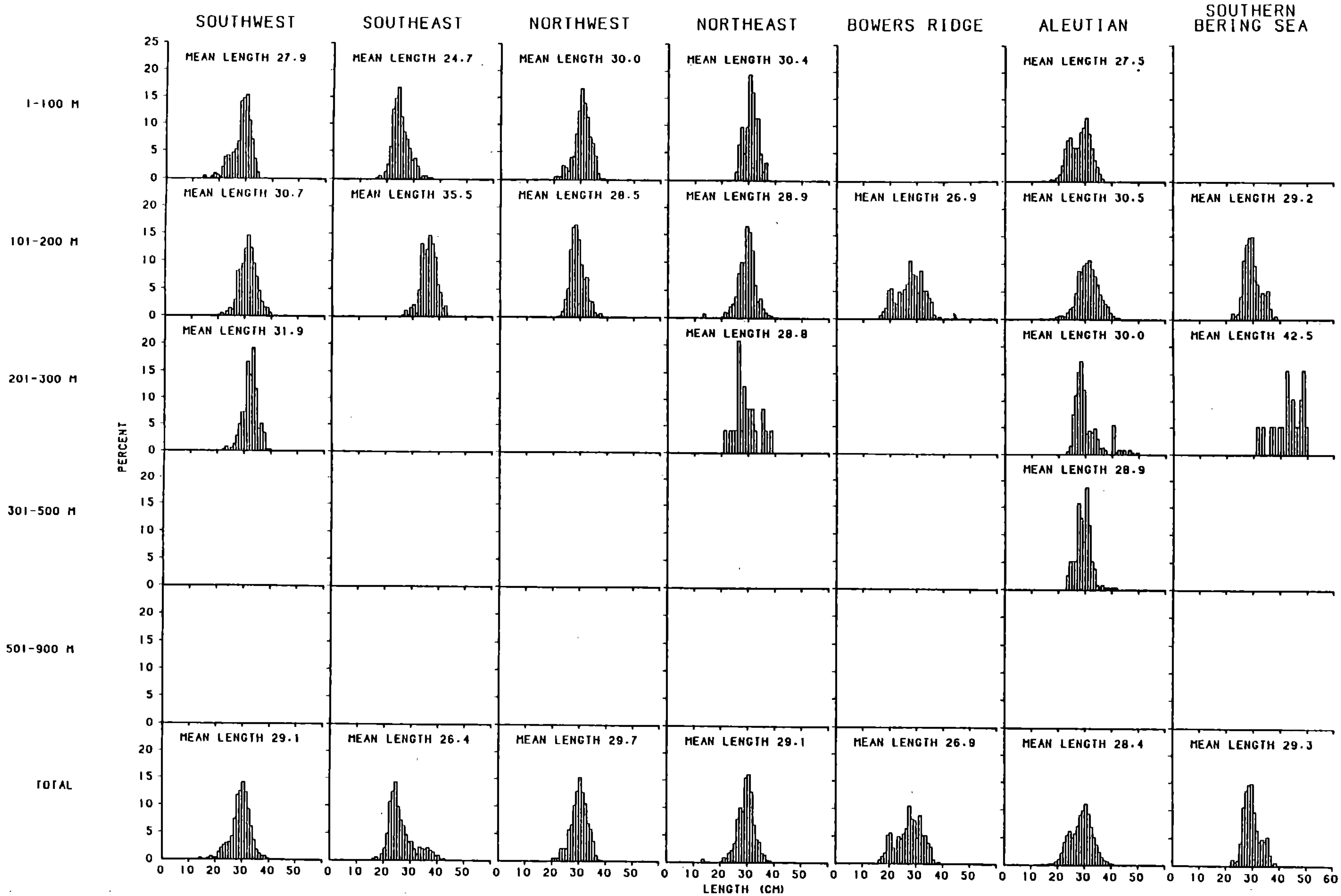

Figure 51.--Size composition of northern rockfish, sexes combined, by survey area, subarea, and depth zone.

Table 20.--Mean CPUE (kg/h) and estimated biomass for shortraker rockfish by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.6	76
		101-200	1.0	183
		201-300	3.4	400
		301-500	166.9	24,447
		501-900	9.4	2,808
		1-900	32.0	27,914
	Southwest	1-100	2.4	76
		101-200	0.1	7
		201-300	0.6	13
		301-500	188.7	6,301
		501-900	18.2	1,189
		1-900	34.4	7,586
	Southeast	1-100	0.0	0
		101-200	0.7	31
		201-300	5.2	200
		301-500	126.0	4,628
		501-900	14.8	627
		1-900	28.4	5,486
	Northwest	1-100	0.0	0
		101-200	0.0	0
		201-300	4.7	54
		301-500	108.1	2,736
		501-900	7.4	433
		1-900	21.1	3,223
	Northeast	1-100	0.0	0
		101-200	2.7	145
		201-300	0.6	19
		301-500	282.2	10,133
		501-900	8.8	547
		1-900	51.8	10,844
	Bowers Ridge	1-100	0.0*	0*
		101-200	0.0	0
		201-300	8.6	114
		301-500	39.5	649
		501-900	0.2	12
		1-900	7.3	775
Bering Sea				
	Southern	1-100	0.0	0
		101-200	0.0	0
		201-300	57.0	694
		301-500	854.1	11,051
		501-900	57.1	1,335
		1-900	100.8	13,080

* No sampling area available.

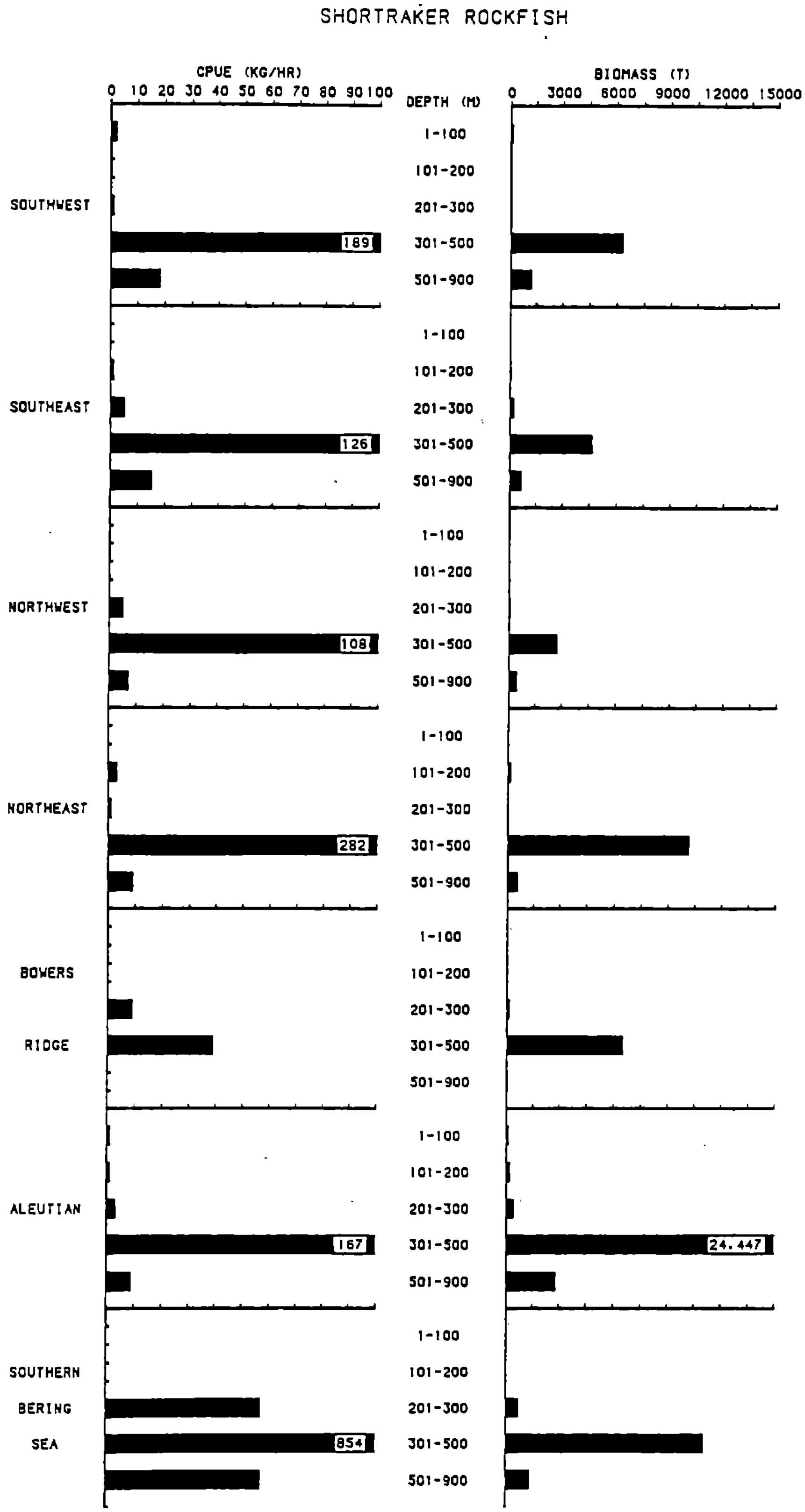

Figure 52.--Mean CPUE (kg/h) and estimated biomass (t) for shortraker rockfish by area, subarea and depth interval.

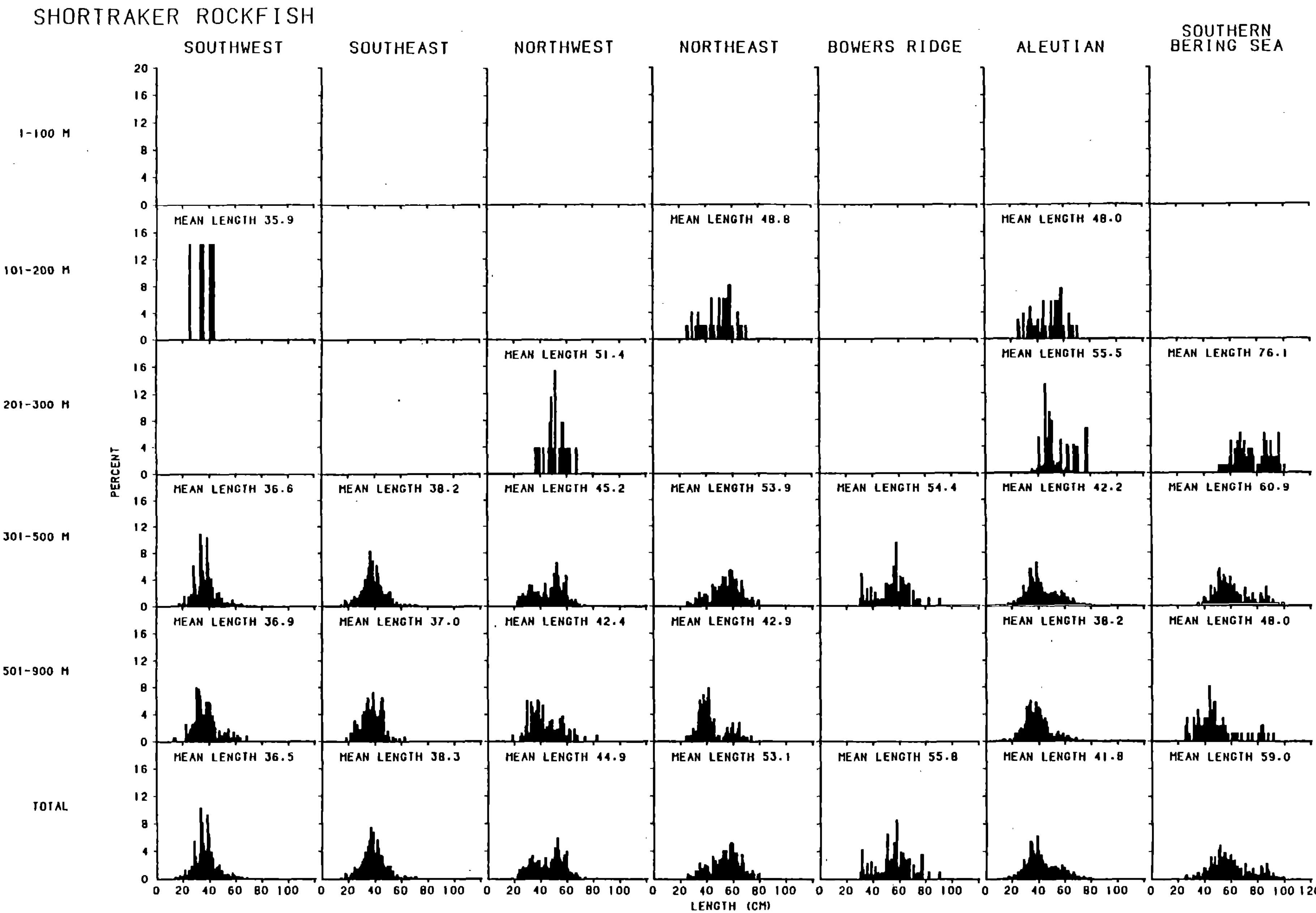

Figure 53. --Size composition of shortraker rockfish, sexes combined, by survey area, subarea, and depth zone.

from west to east as the range of the size composition broadened and the principal length modes contained fish 50 cm or longer. Shortraker rockfish from the southern Bering Sea subarea had the largest mean length.

Rougheye rockfish (Sebastes aleutianus)--Rougheye rockfish occurred in highest density in the northeast subarea where the mean catch rate was 35 kg/h (Table 21). With the exception of the northwest subarea, rougheye rockfish density was generally equal among subareas as the catch rates ranged from 21 to 26 kg/h. Over 36% (20,600 t) of the estimated biomass from the Aleutian Islands subareas was located in the northeast subarea. Similar to shortraker rockfish, rougheye rockfish were most abundant in the 301- to 500-m depth interval (Fig. 54).

Throughout the survey area, the majority of rougheye rockfish ranged from 25 to 50 cm (Fig. 55). In the northeast, Bowers Ridge, and the southern Bering Sea subareas, a higher percentage of larger individuals (41-50 cm) were found in contrast to the southwest subarea where a larger percentage of smaller fish (31-40 cm) were present.

Shortspine thornyhead (Sebastolobus alascanus)--Shortspine thornyheads occurred in highest density in the Bowers Ridge, southwest, and northwest subareas. In the Bowers Ridge subarea the mean catch rate -ranged from 22 to 29 kg/h and in the 301-500 and 501-900 m depth intervals, 26 and 37 kg/h, respectively (Table 22, Fig. 56). In the Aleutian Islands area the estimated biomass of 15,100 t was evenly distributed among the five subareas.

The size composition of shortspine thornyheads in the southeast, northeast, Bowers Ridge, and southern Bering Sea subareas were similar with a high percentage of the population occurring in the 25- to 50-cm size range (Fig. 57). The southwest subarea contained a much higher percentage of

Table 21.--Mean CPUE (kg/h) and estimated biomass for rougheye rockfish by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.7	90
		101-200	14.1	2,769
		201-300	42.2	5,002
		301-500	87.0	12,530
		501-900	0.7	190
		1-900	23.8	20,581
	Southwest	1-100	2.4	79
		101-200	36.3	2,303
		201-300	44.6	844
		301-500	51.3	1,568
		501-900	2.3	143
		1-900	24.0	4,937
	Southeast	1-100	0.0	0
		101-200	4.5	183
		201-300	17.3	611
		301-500	86.2	3,011
		501-900	0.0	0
		1-900	21.1	3,805
	Northwest	1-100	0.4	11
		101-200	2.6	87
		201-300	28.6	300
		301-500	35.4	896
		501-900	0.0	0
		1-900	8.8	1,294
	Northeast	1-100	0.0	0
		101-200	3.4	193
		201-300	10.8	352
		301-500	87.2	7,013
		501-900	0.9	47
		1-900	34.8	7,606
	Bowers Ridge	1-100	0.0*	0*
		101-200	1.1	3
		201-300	18.5	2,895
		301-500	2.5	42
		501-900	0.0	0
		1-900	26.4	2,940
Bering Sea				
	Southern	1-100	0.0	0
		101-200	1.8	60
		201-300	89.9	986
		301-500	45.7	1,768
		501-900	0.7	15
		1-900	22.4	2,829

* No sampling area available.

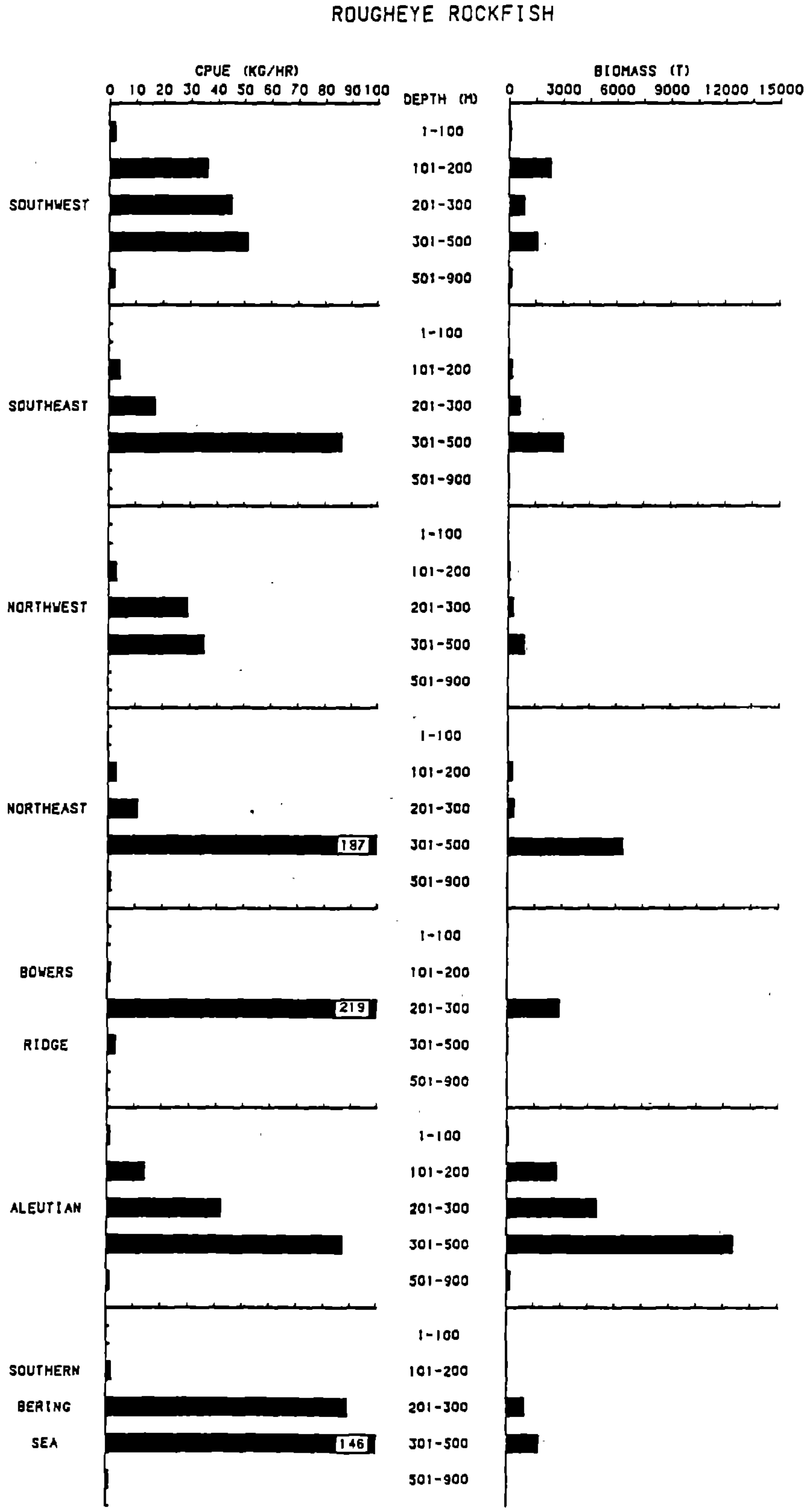

Figure 54.--Mean CPUE (kg/h) and estimated biomass (t) for rougheye rockfish by area, subarea, and depth interval.

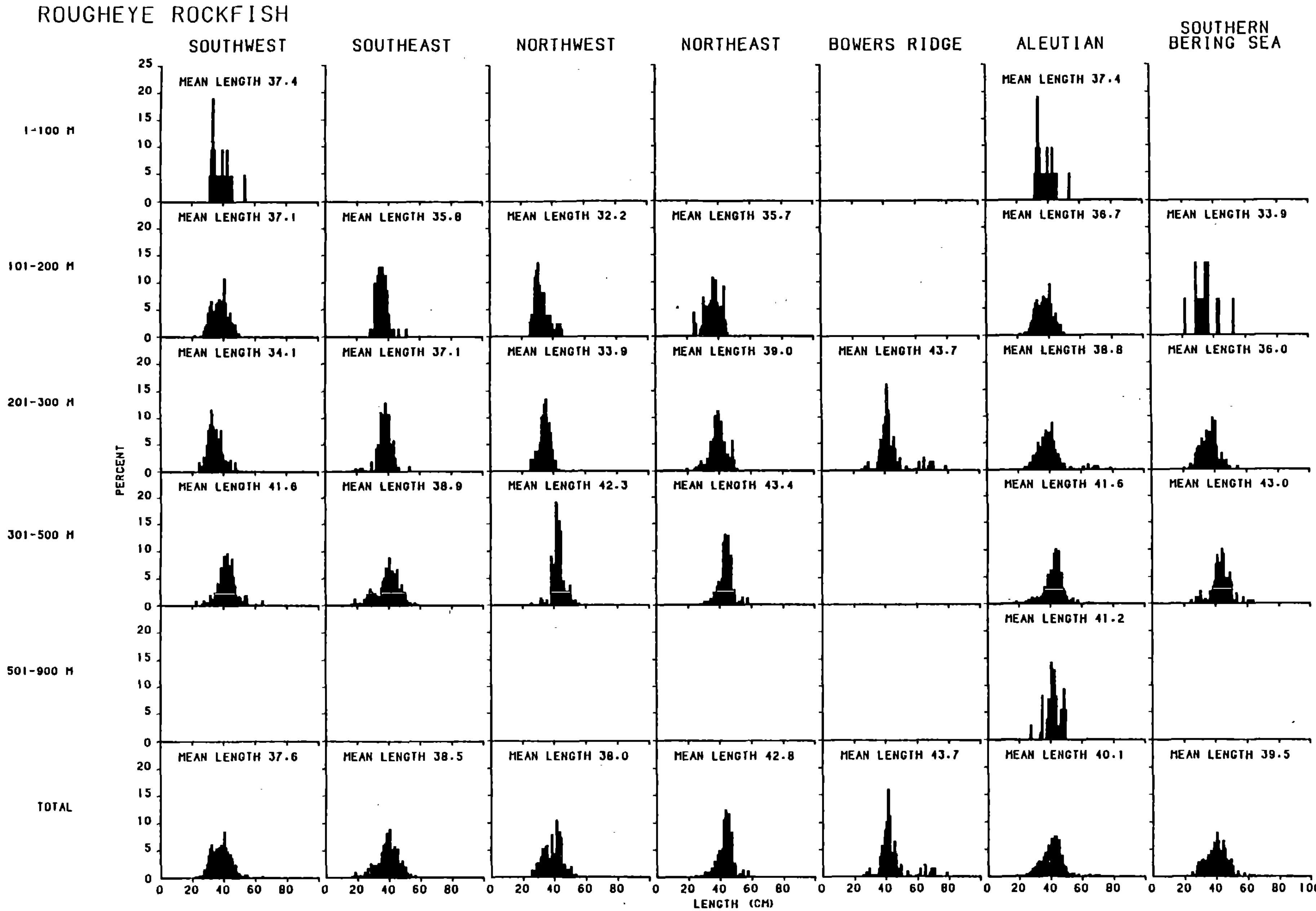

Figure 55. --Size composition of rougheye rockfish, sexes combined, by survey area, subarea, and depth zone.

Table 22.--Mean CPUE (kg/h) and estimated biomass for shortspine thornyhead by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.3	35
		101-200	0.2	32
		201-300	3.0	376
		301-500	26.4	3,657
		501-900	36.9	11,038
		1-900	17.7	15,138
	Southwest	1-100	1.1	35
		101-200	0.3	19
		201-300	3.2	64
		301-500	31.2	945
		501-900	55.2	3,642
		1-900	22.5	4,705
	Southeast	1-100	0.0 a/	0
		101-200	0.0 a/	1
		201-300	1.0	40
		301-500	24.6	883
		501-900	34.8	1,394
		1-900	12.1	2,318
	Northwest	1-100	0.0	0
		101-200	0.0	0
		201-300	4.9	66
		301-500	11.9	277
		501-900	48.7	2,987
		1-900	22.2	3,330
	Northeast	1-100	0.0	0
		101-200	0.3	12
		201-300	0.1	2
		301-500	16.0	509
		501-900	22.6	1,416
		1-900	9.7	1,939
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	0.0	0
		201-300	15.1	204
		301-500	67.9	1,043
		501-900	24.2	1,599
		1-900	29.2	2,846
Bering Sea				
	Southern	1-100	0.0	0
		101-200	0.0	0
		201-300	0.9	10
		301-500	54.0	693
		501-900	31.7	711
		1-900	11.2	1,414

a/ Less than 0.1 kg/h.
b/ No sampling area available.

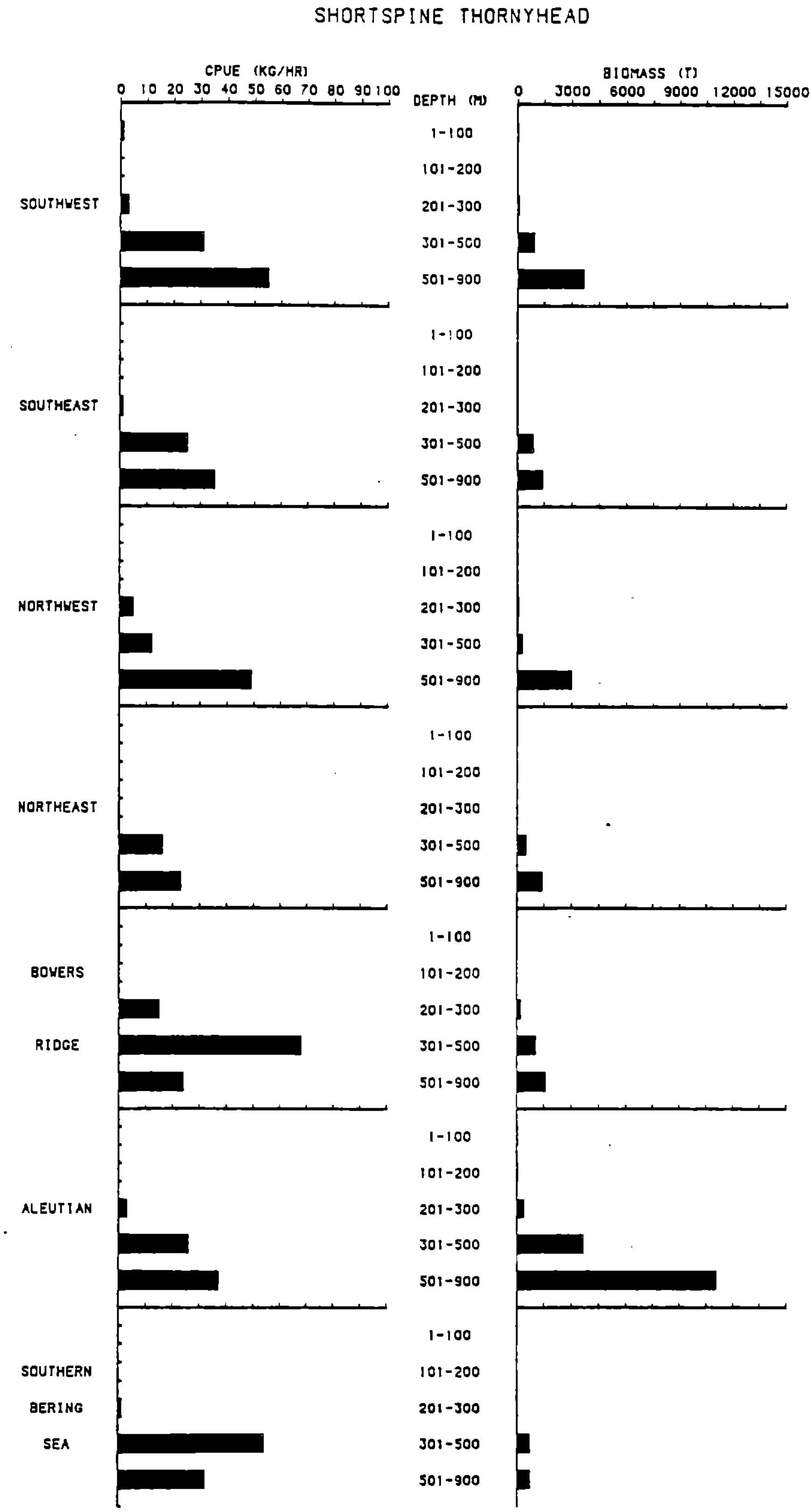

Figure 56.--Mean CPUE (kg/h) and estimated biomass (t) for shortspine thornyhead by area, subarea, and depth interval.

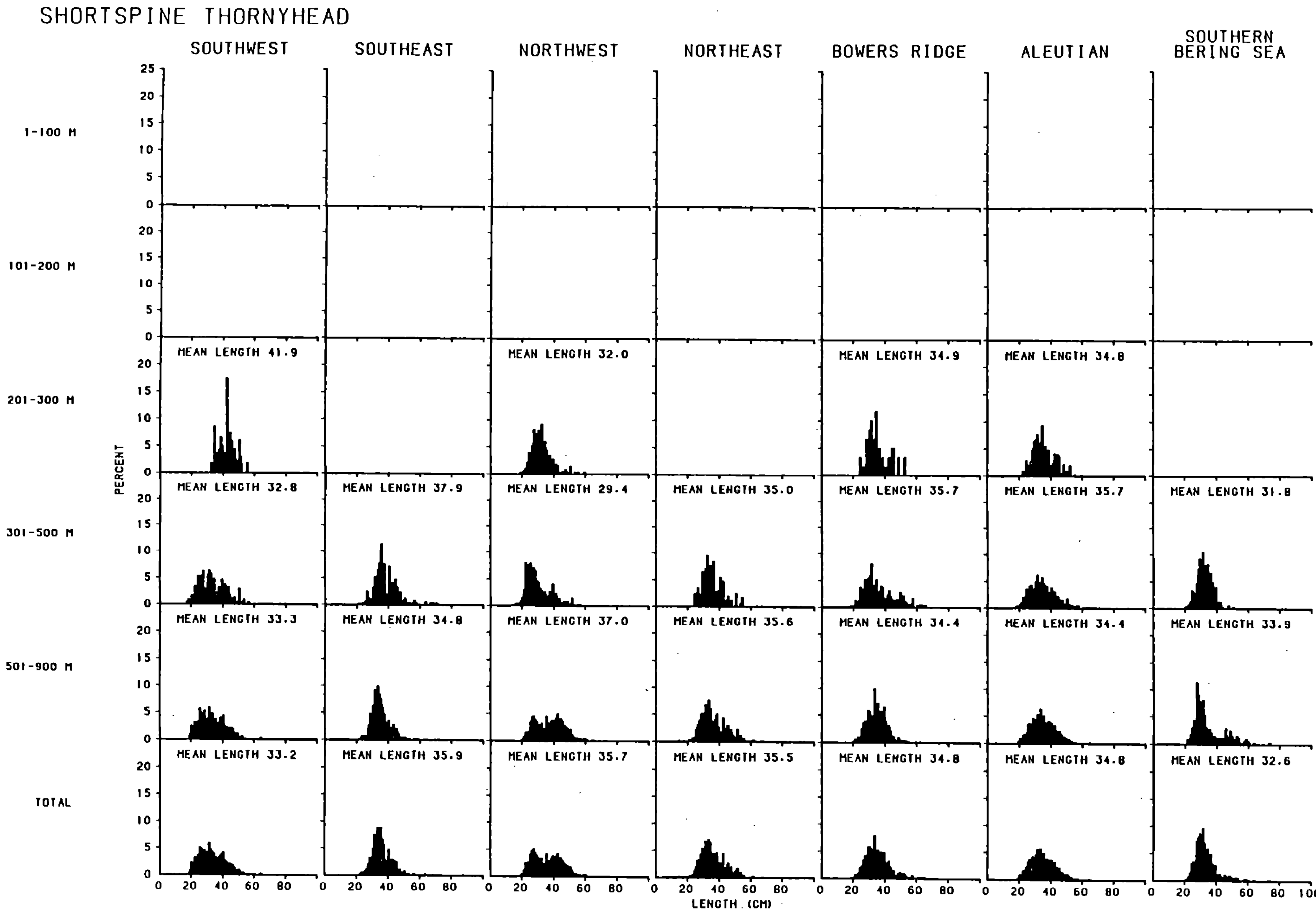

Figure 57.--Size composition of shortspine thornyhead, sexes combined, by survey area, subarea, and depth zone.

smaller fish, 20-40 cm, while the northwest subarea contained nearly equal portions of two size groups, 20-35 and 35-53 cm.

Flatfish

The populations of flatfish in the Aleutian Islands and the southern Bering Sea are small compared to other areas of the northeastern Pacific ocean and the Bering Sea. Of the seven species of flatfish included in this report, only three species, Greenland turbot, arrowtooth flounder, and Pacific halibut, may support continued commercial exploitation.

Greenland turbot (*Reinhardtius hippoglossoides*)--Although Greenland turbot were captured in all subareas of the survey area, they are primarily distributed in the northeast and southern Bering Sea subareas where mean catch rates were 170 and 116 kg/h, respectively (Table 23). In both subareas, highest abundance was found in the 501- to 900-m depth interval (Fig. 58). Nearly 75% of the total estimated biomass of the Aleutian Islands subareas (49,800 t) was contained in the northeast subarea, while 28% was estimated for the southern Bering Sea.

The size composition of Greenland turbot was similar in the northeast and southern Bering Sea subareas, displaying a bimodal distribution of two prominent size groups: 50-75 and 78-95 cm (Fig. 59). In the southern Bering Sea subarea there was a higher percentage of larger fish than in the northeast subarea.

Arrowtooth flounder (*Atheresthes stomias*) --Arrowtooth flounder were primarily distributed along the north side of the Aleutian Islands and into the southern Bering Sea. Highest densities were found in the northeast subarea where the mean catch rate was 90 kg/h (Table 24). In the northeast

Table 23.--Mean CPUE (kg/h) and estimated biomass (t) for Greenland turbot by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.0	0
		101-200	0.1	18
		201-300	1.4	155
		301-500	102.6	14,944
		501-900	115.2	34,715
		1-900	57.3	49,832
	Southwest	1-100	0.0	0
		101-200	0.1	7
		201-300	3.1	60
		301-500	21.8	666
		501-900	9.2	611
		1-900	6.5	1,344
	Southeast	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	13.3	435
		501-900	18.1	731
		1-900	6.3	1,166
	Northwest	1-100	0.0	0
		101-200	0.0	0
		201-300	1.6	19
		301-500	92.7	2,200
		501-900	44.2	2,609
		1-900	33.3	4,828
	Northeast	1-100	0.0	0
		101-200	0.2	11
		201-300	2.2	69
		301-500	257.8	9,755
		501-900	416.3	27,510
		1-900	170.3	37,345
	Bowers Ridge	1-100	0.0*	0*
		101-200	0.0	0
		201-300	0.5	7
		301-500	125.2	1,888
		501-900	49.6	3,254
		1-900	54.1	5,149
Bering Sea				
	Southern	1-100	0.0	0
		101-200	0.0	0
		201-300	5.1	54
		301-500	113.6	1,320
		501-900	577.2	12,659
		1-900	115.7	14,033

* No sampling area available.

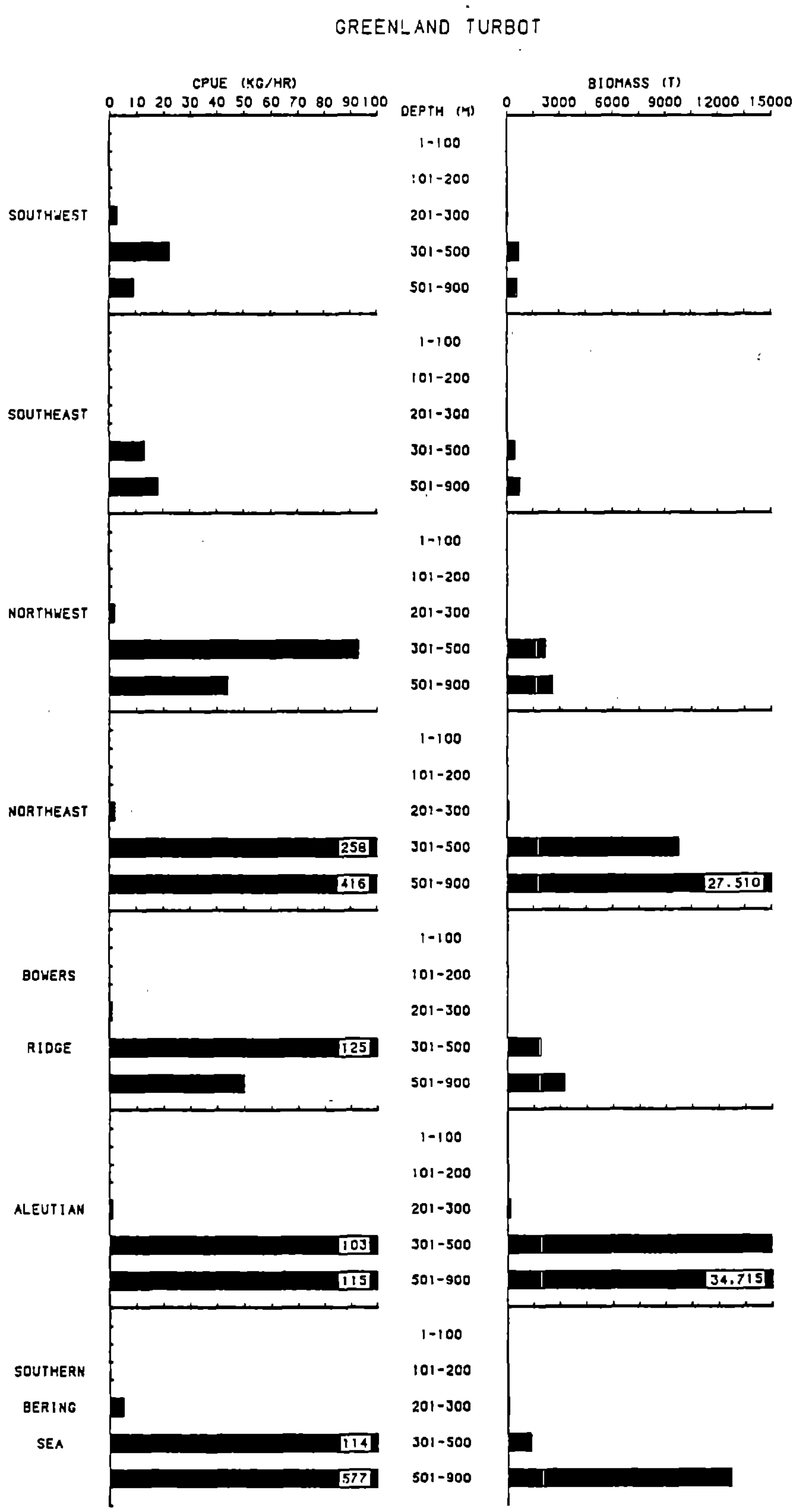

Figure 58.--Mean CPUE (kg/h) and estimated biomass (t) for Greenland turbot by area, subarea, and depth interval.

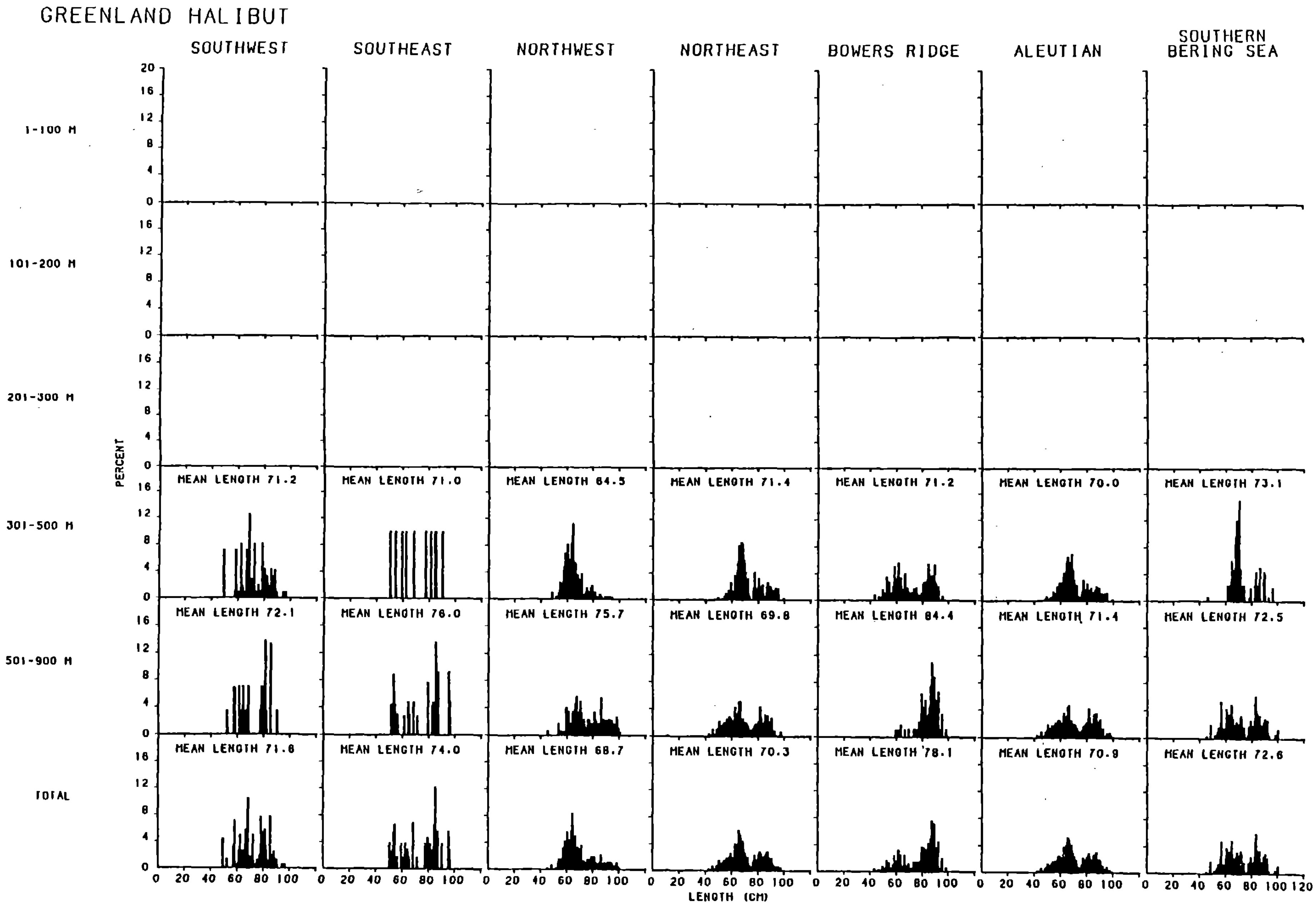

Figure 59.--Size composition of Greenland turbot, sexes combined, by survey area, subarea, and depth zone.

Table 24.--Mean CPUE (kg/h) and estimated biomass (t) for arrowtooth flounder by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	8.3	914
		101-200	29.5	5,531
		201-300	40.7	4,343
		301-500	128.9	18,660
		501-900	34.4	10,440
		1-900	46.7	39,888
	Southwest	1-100	12.9	331
		101-200	20.8	1,227
		201-300	18.9	365
		301-500	39.7	1,192
		501-900	16.8	1,129
		1-900	21.1	4,244
	Southeast	1-100	12.9	442
		101-200	54.9	2,355
		201-300	60.5	2,091
		301-500	30.6	1,032
		501-900	15.6	622
		1-900	36.6	6,542
	-Northwest	1-100	0.0 a/	1
		101-200	9.3	270
		201-300	71.0	784
		301-500	235.0	5,733
		501-900	38.6	2,310
		1-900	61.9	9,098
	Northeast	1-100	5.2	140
		101-200	29.5	1,679
		201-300	27.7	910
		301-500	286.8	10,618
		501-900	95.3	6,305
		1-900	90.2	19,652
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	0.0	0
		201-300	14.3	193
		301-500	5.8	85
		501-900	1.1	74
		1-900	3.4	352
Bering Sea				
	Southern	1-100	11.8	551
		101-200	139.0	4,527
		201-300	49.5	540
		301-500	103.0	1,278
		501-900	119.6	2,626
		1-900	76.3	9,522

a/ Less than 0.1 kg/h.
b/ No sampling area available.

and northwest subareas the depth range of highest abundance was the 301- to 500-m depth interval, while in the southern Bering Sea subarea it was both the l0l- to 200-m and 501- to 900-m depth intervals (Fig. 60). Forty-nine percent of the total estimated biomass of the Aleutian Islands subareas (19,700 t) was located in the northeast subarea and 23% was in the northwest subarea. The estimated biomass in the southern Bering Sea subarea was 9,500 t, similar to the abundance estimated for the northwest subarea (9,100 t).

The size compositions in the three subareas which contained the majority of the biomass were quite different (Fig. 61). In the northeast subarea the size ranged from 30 to 90 cm with the principal mode between 55 and 61 cm. The northwest and southern Bering Sea subareas contained higher percentages of smaller fish: a 40- to 55-cm mode in the northwest subarea and a 20- to 40-cm mode in the southern Bering Sea.

Pacific halibut (*Hippoglossus stenolepis*)--Pacific halibut were primarily distributed in the southern Bering Sea subarea and the eastern portion of the Aleutian Islands area. The highest mean catch rates occurred in the southern Bering Sea subarea (56 kg/h), and by depth, in the l- to 100-m and l0l- to 200-m depth intervals throughout the survey area (Table 25, Fig. 62). Over 75% of the total estimated biomass of the Aleutian Islands area (13,500 t) was contained in the northeast (6,800 t) and southeast (6,700 t) subareas, and 7,300 t was estimated for the southern Bering Sea.

The size composition of Pacific halibut within the subareas of principal abundance varied (Fig. 63). Although the size range was similar in all three subareas, the size at which the principal mode was found varied from 45-70 cm in the southern Bering Sea subarea to 25-40 cm in the northeast subarea and 70-90 cm in the southeast subarea.

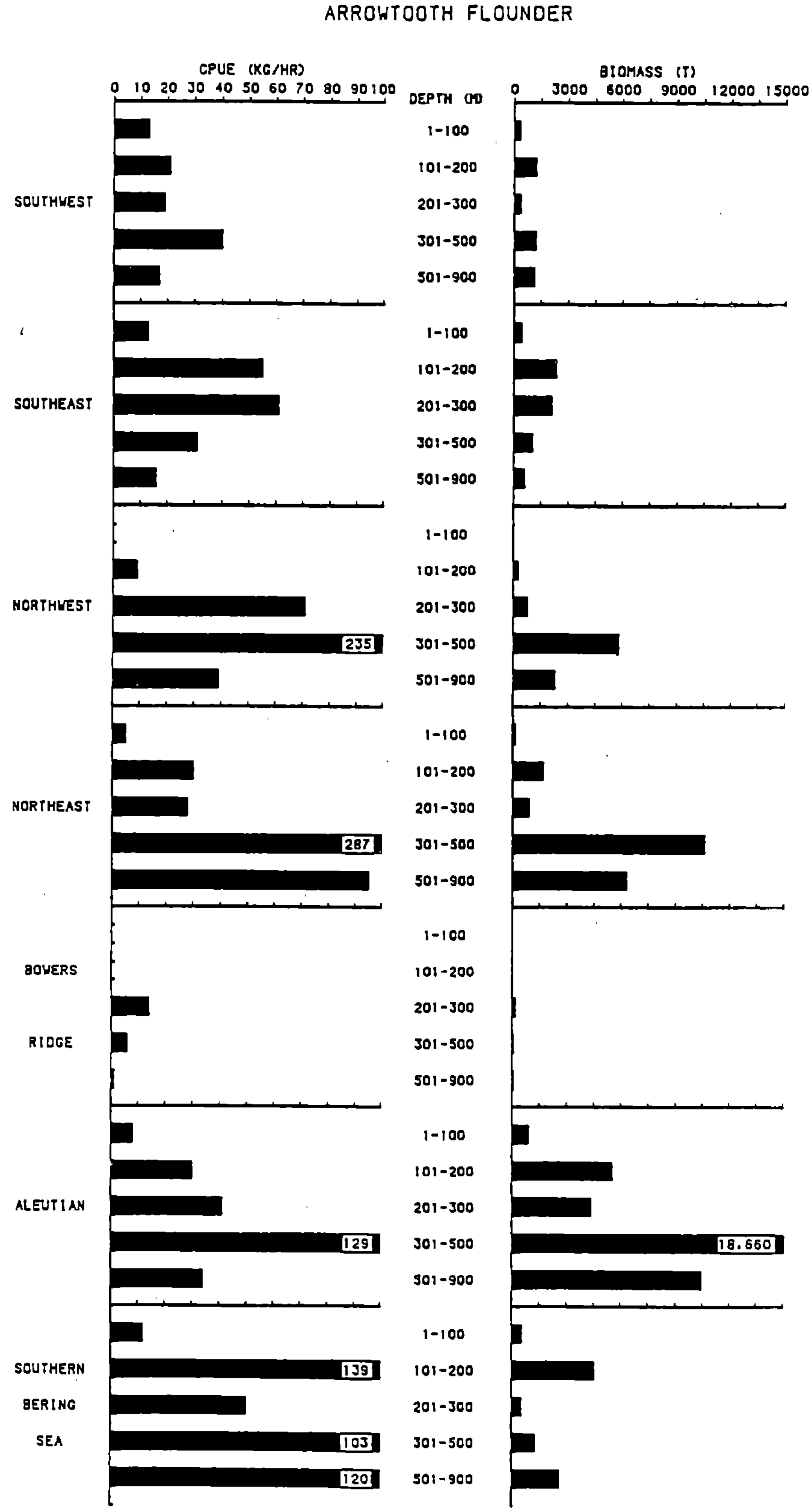

Figure 60.--Mean CPUE (kg/h) and estimated biomass (t) for arrowtooth flounder by area, subarea, and depth interval.

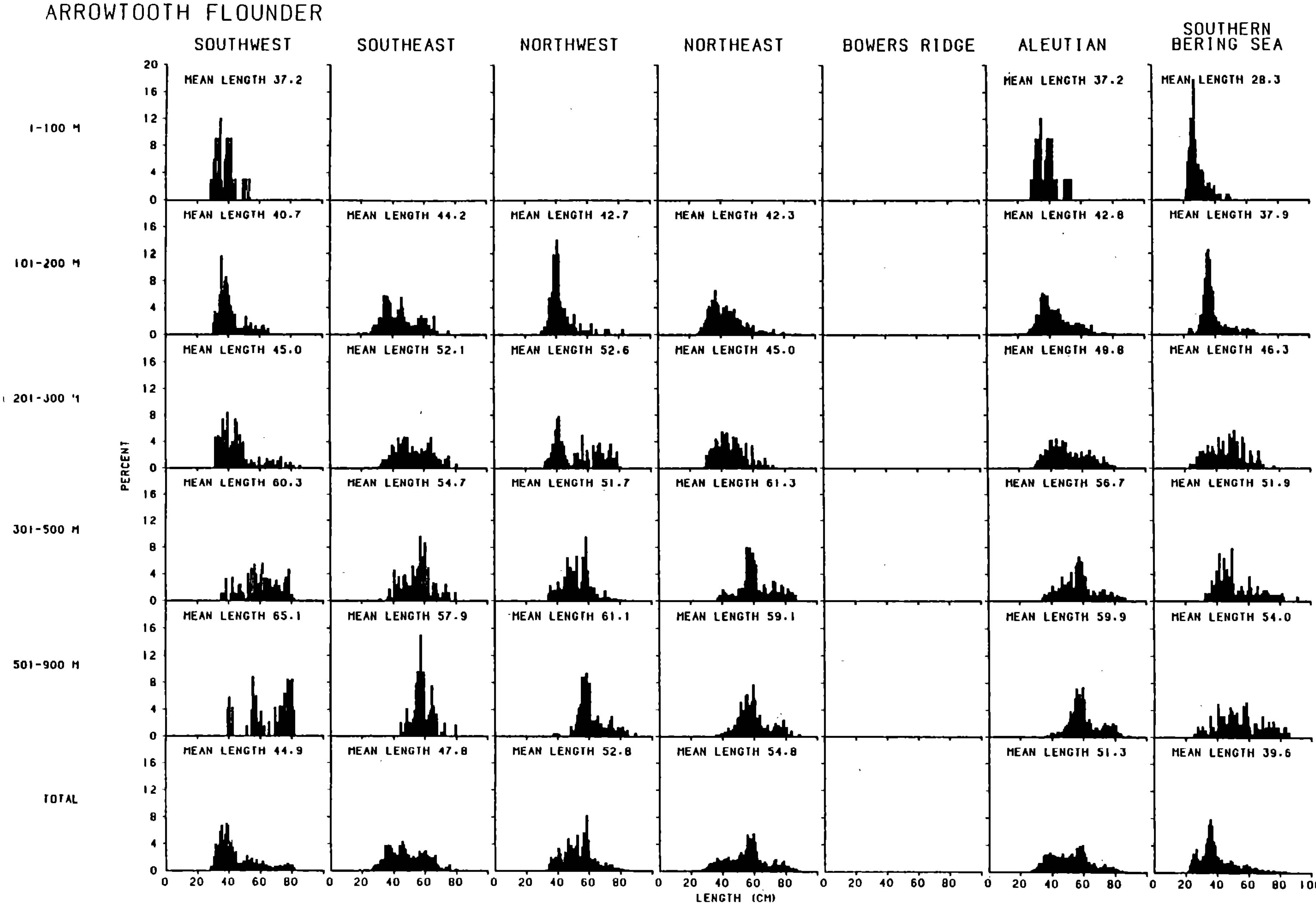

Figure 61.--Size composition of arrowtooth flounder, sexes combined, by survey area, subarea, and depth zone.

Table 25.--Mean CPUE (kg/h) and estimated biomass (t) for Pacific halibut by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	38.6	4,263
		101-200	45.0	8,039
		201-300	32.3	3,351
		301-500	14.5	2,051
		501-900	0.3	67
		1-900	21.9	17,771
	Southwest	1-100	10.7	325
		101-200	7.8	480
		201-300	5.5	104
		301-500	9.2	239
		501-900	0.0	0
		1-900	5.8	1,148
	Southeast	1-100	27.1	869
		101-200	86.1	3,478
		201-300	51.9	1,768
		301-500	15.9	555
		501-900	0.0	0
		1-900	38.5	6,670
	Northwest	1-100	54.9	1,369
		101-200	45.2	1,184
		201-300	25.9	263
		301-500	4.8	115
		501-900	0.0	0
		1-900	20.1	2,931
	Northeast	1-100	68.3	1,700
		101-200	54.5	2,884
		201-300	39.6	1,216
		301-500	22.8	883
		501-900	1.4	67
		1-900	32.5	6,750
	Bowers Ridge	1-100	0.0*	0*
		101-200	5.0	13
		201-300	0.0	0
		301-500	16.8	259
		501-900	0.0	0
		1-900	2.8	272
Bering Sea				
	Southern	1-100	73.2	3,697
		101-200	98.3	3,235
		201-300	18.5	194
		301-500	4.9	50
		501-900	5.5	128
		1-900	56.3	7,304

* No sampling area available.

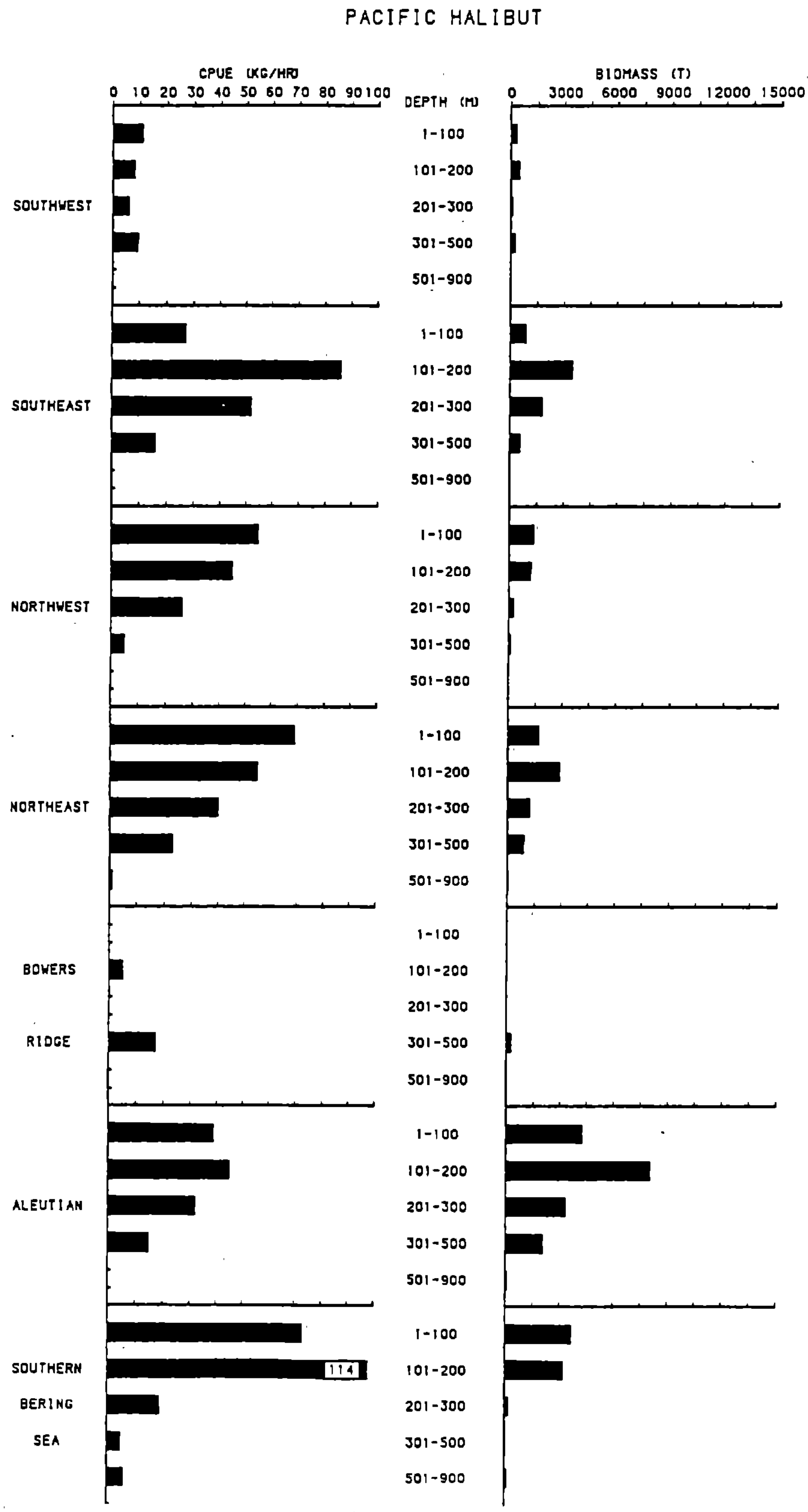

Figure 62.--Mean CPUE (kg/h) and estimated biomass (t) for Pacific halibut by area, subarea, and depth interval.

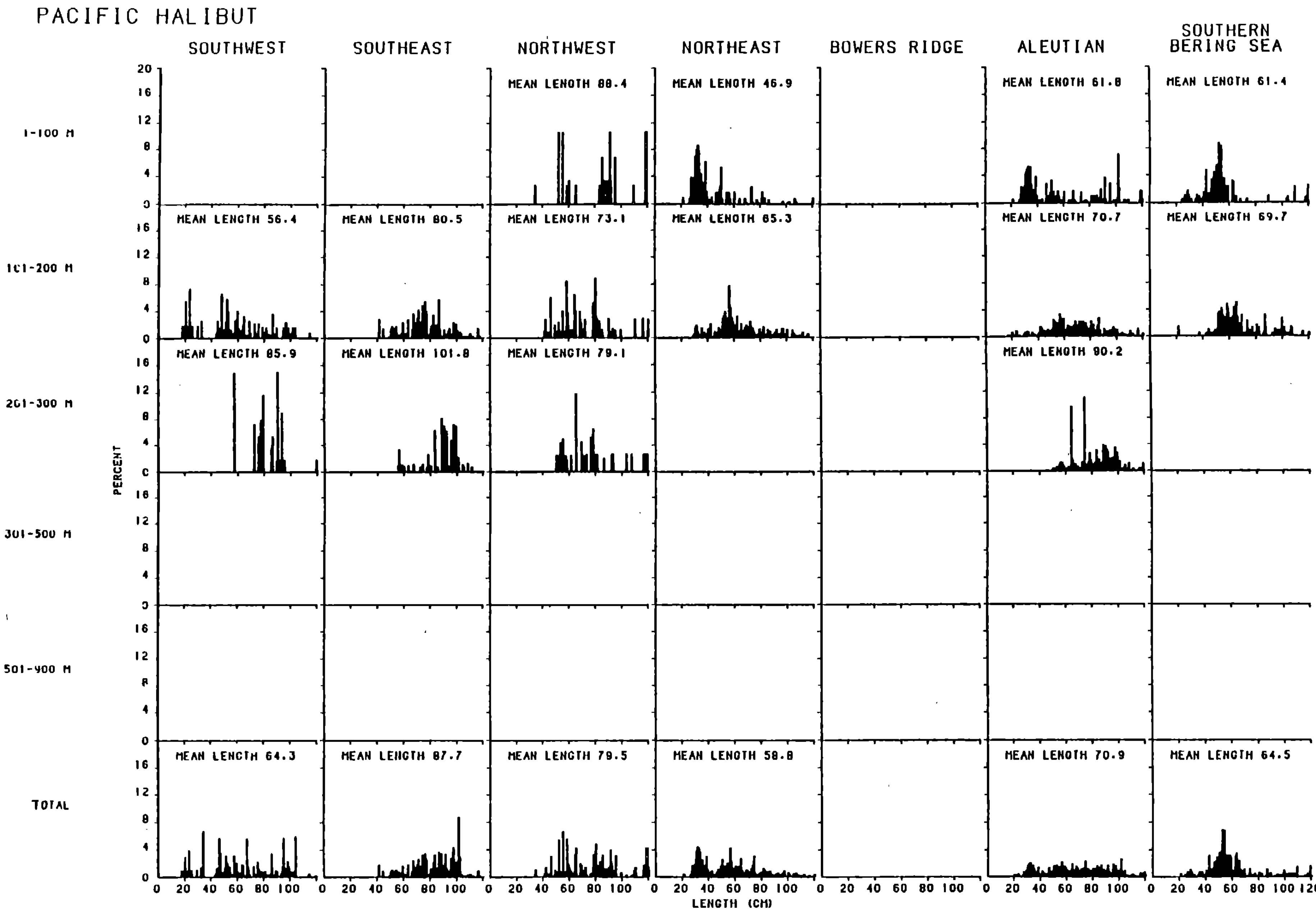

Figure 63.--Size composition of Pacific halibut, unsexed, by survey area, subarea, and depth zone.

Other Flounders

Four other species of flounders are found in the Aleutian Islands area and the southern Bering Sea subarea: rock sole (Pleuronecetes bilineata); rex sole (Glyptocephalus zachirus); Dover sole (Microstomus pacificus); and flathead sole (Hippoglossoides elassodon). The abundance of these species is quite low and although the populations may produce a few catches large enough to be of commercial value, they probably will not be able to sustain the continued harvesting of a directed fishery. Available data on these species are presented in Figures 64-68 and Tables 26-29.

Skates

Several species of skates (Rajidae and Bathyrajidae) are distributed in the Aleutian Islands area and the southern Bering Sea. Since it is difficult to differentiate among species, they have been combined into one group. Skates are found throughout the survey area and were most abundant along the north side of the Aleutian Islands area and the southern Bering Sea subarea where the mean catch rates ranged from 24 to 29 kg/h (Table 30). In the Aleutian Islands area the highest mean catch rates occurred in the 201- to 300-m and 301- to 500-m depth intervals, while in the southern Bering Sea subarea they occurred in the l0l-, to 200-m and 301- to 500-m depth intervals (Fig. 69). In the Aleutian Islands area the estimated biomass (17,400 t) was fairly evenly divided between all subareas with the exception of Bowers Ridge, and also among all depth intervals except the shallowest.

Red squid (Berryteuthis magister)

Red squid were found in all subareas of the survey area with the highest mean catch rates encountered in the southwest subarea, and by depth, in the 201- to 300-m depth interval (Table 31, Fig. 70). Over 69% of the total

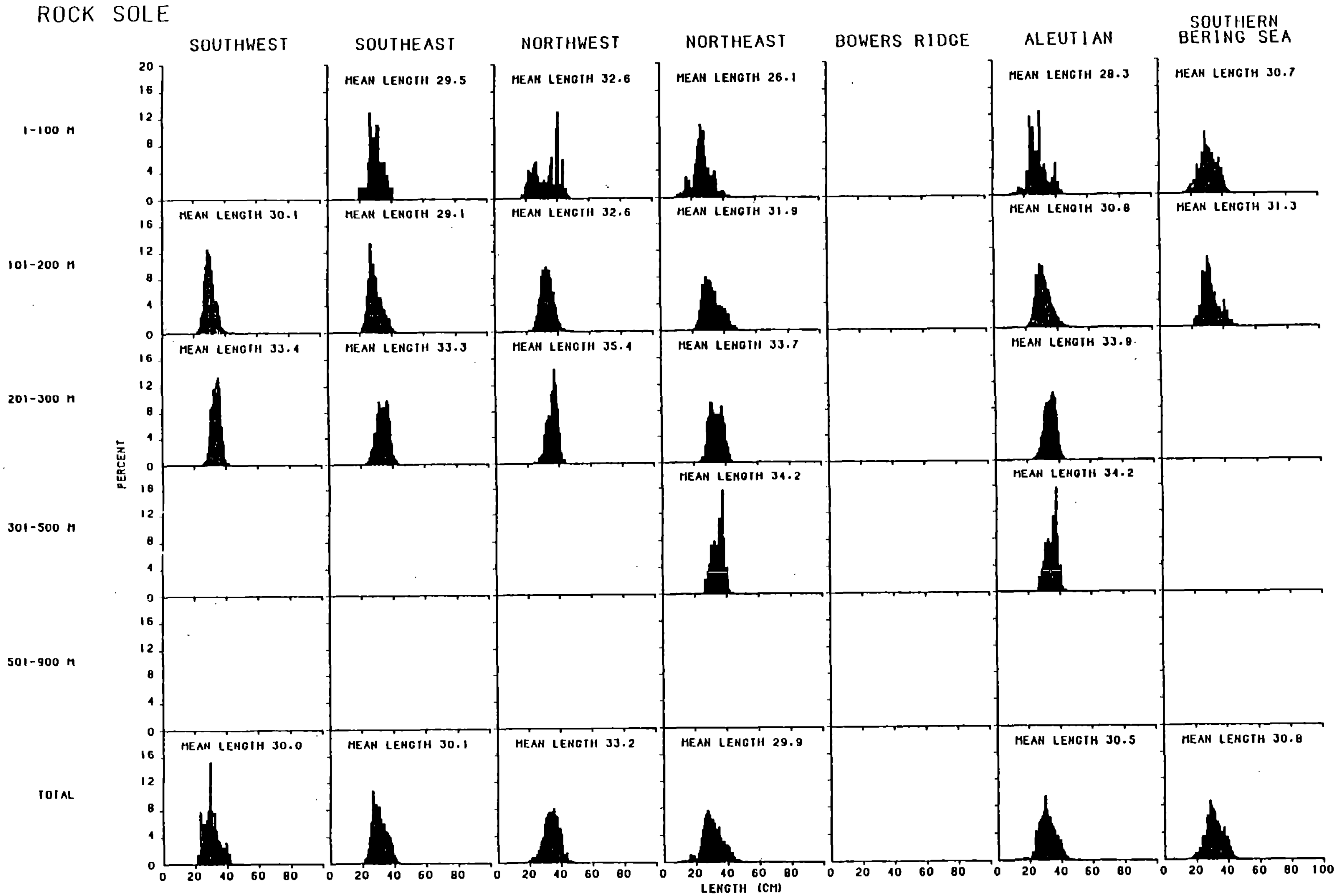

Figure 64. --Size composition of rock sole, sexes combined, by survey area, subarea, and depth zone.

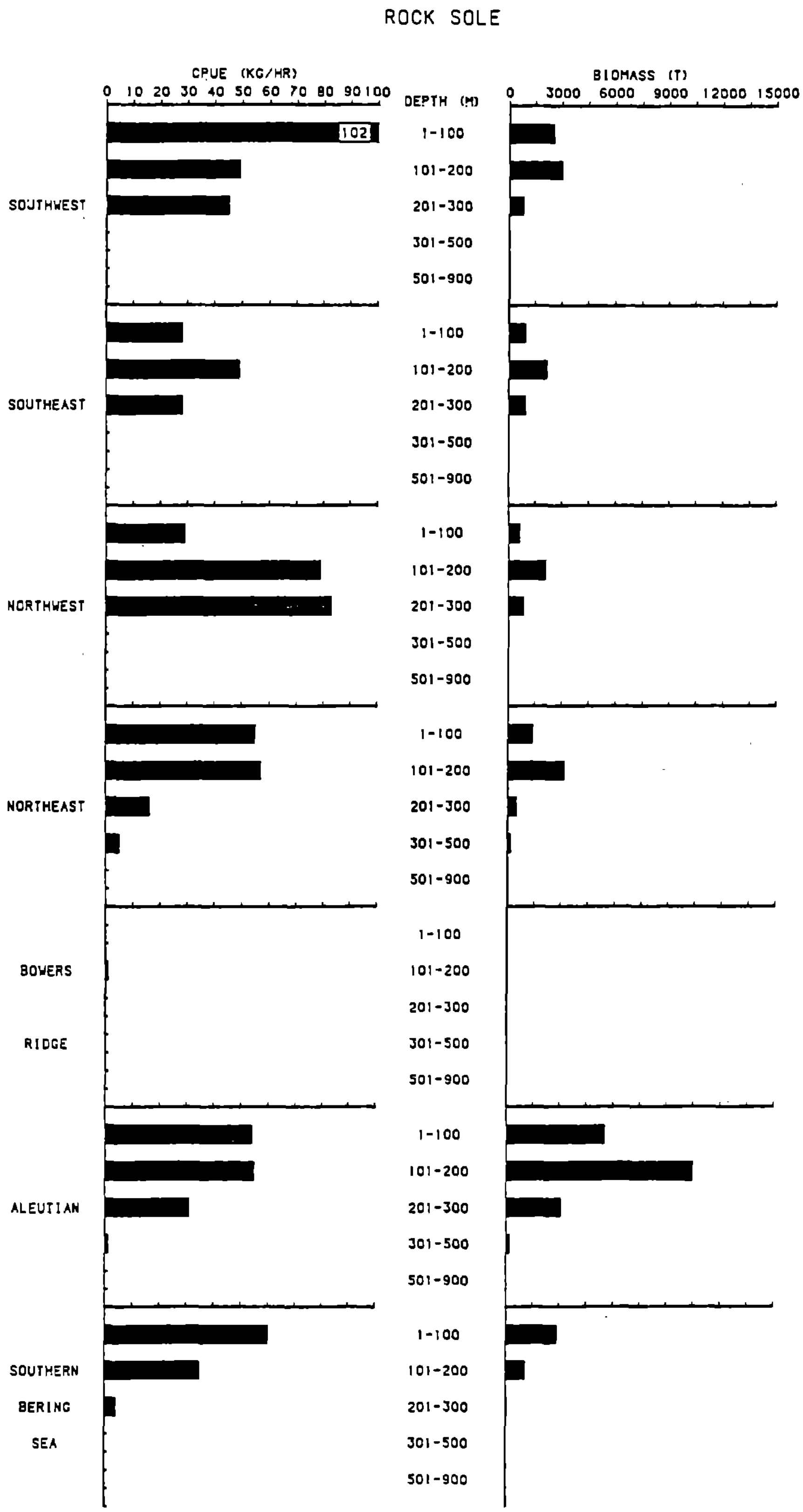

Figure 65. --Mean CPUE (kg/h) and estimated biomass (t) for rock sole by area, subarea, and depth interval.

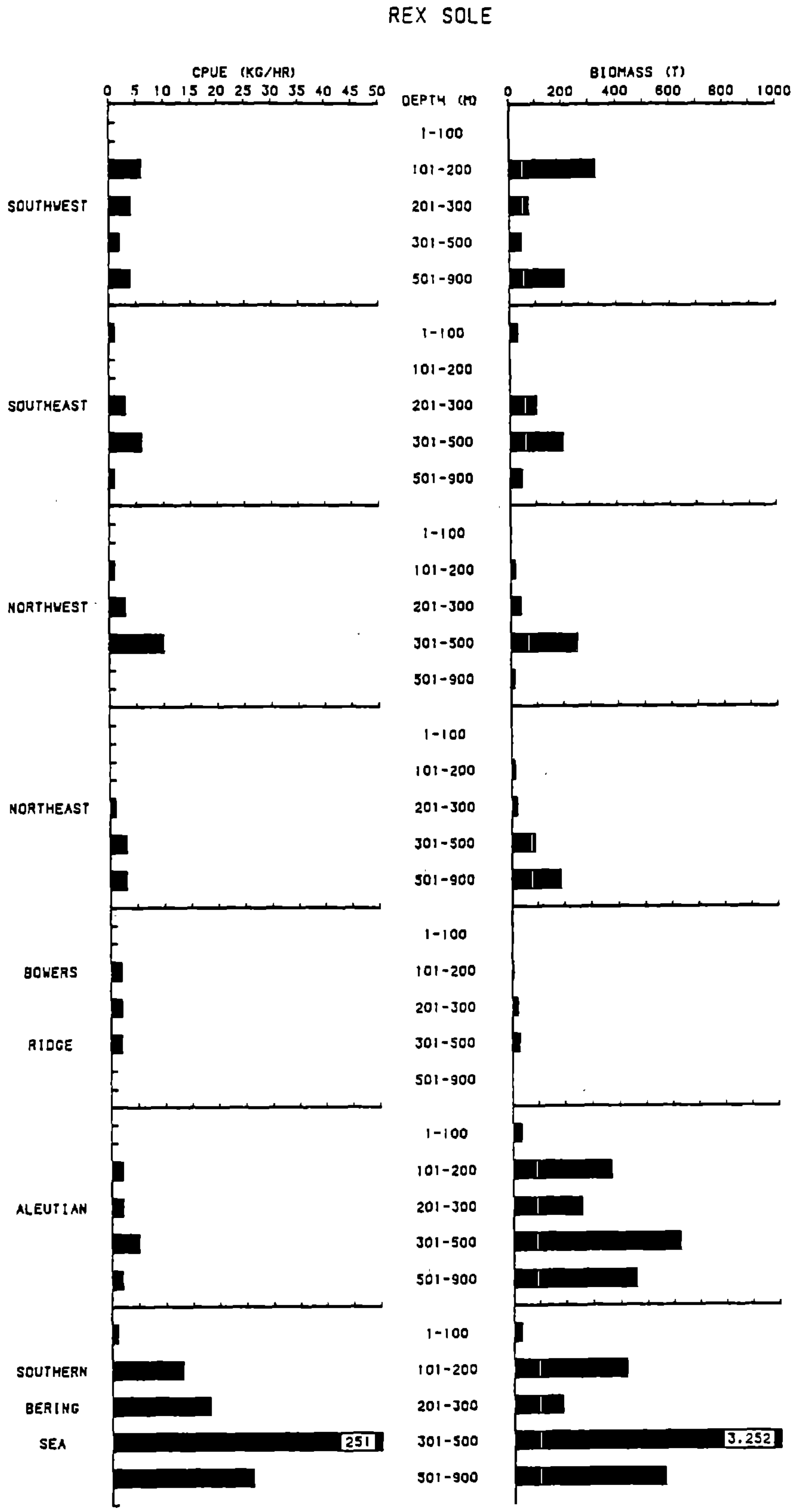

Figure 66.--Mean CPUE (kg/h) and estimated biomass for rex sole by area, subarea, and depth interval.

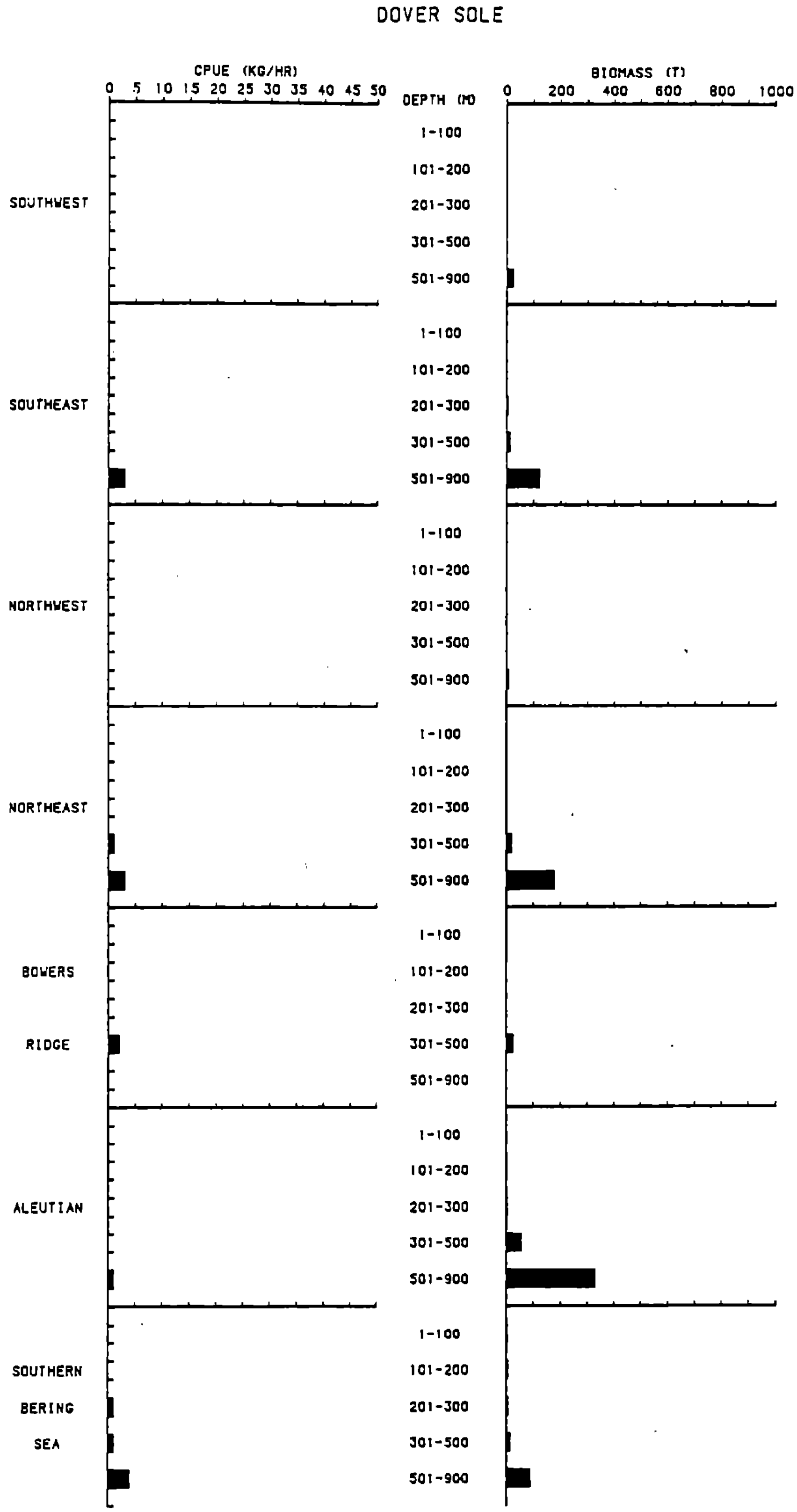

Figure 67. --Mean CPUE (kg/h) and estimated biomass for Dover sole by area, subarea, and depth interval.

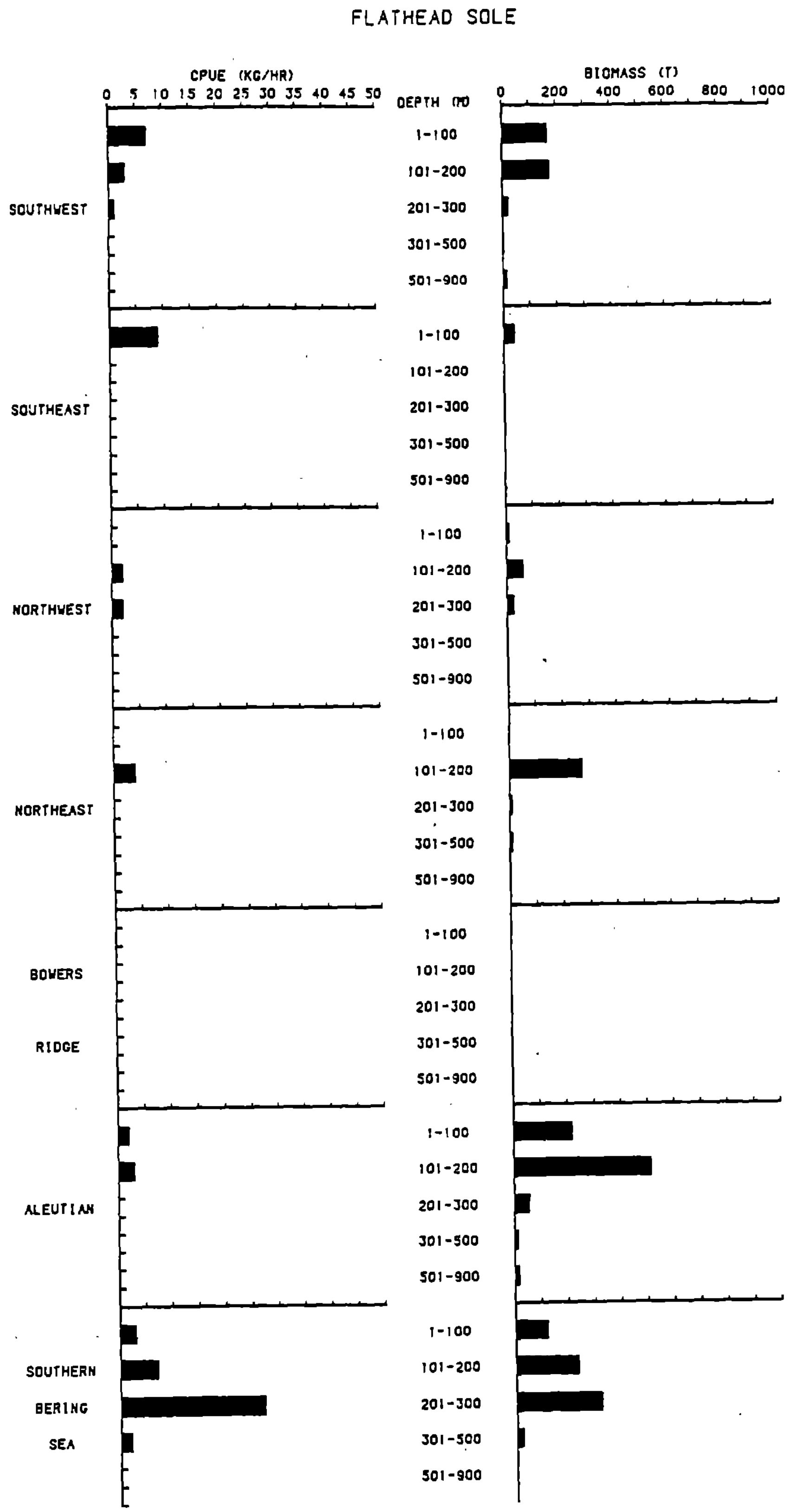

Figure 68. --Mean CPUE (kg/h) and estimated biomass (t) for flathead sole by area, subarea, and depth interval.

Table 26.--Mean CPUE (kg/h) and estimated biomass (t) for rock sole by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	54.1	5,519
		101-200	54.8	10,486
		201-300	30.6	3,102
		301-500	1.3	203
		501-900	0.0 a/	6
		1-900	23.5	19,316
	Southwest	1-100	102.0	2,549
		101-200	48.9	3,006
		201-300	45.1	810
		301-500	0.2	4
		501-900	0.0	0
		1-900	33.3	6,369
	Southeast	1-100	28.3	929
		101-200	48.7	2,141
		201-300	27.5	947
		301-500	0.3	12
		501-900	0.0	0
		1-900	21.8	4,029
	Northwest	1-100	28.6	633
		101-200	79.4	2,137
		201-300	83.4	859
		301-500	0.0	0
		501-900	0.0	0
		1-900	26.4	3,629
	Northeast	1-100	55.1	1,408
		101-200	57.4	3,198
		201-300	15.6	486
		301-500	4.6	187
		501-900	0.1	6
		1-900	24.6	5,285
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	1.3	4
		201-300	0.0	0
		301-500	0.0	0
		501-900	0.0	0
		1-900	0.0 a/	4
Bering Sea				
	Southern	1-100	59.8	2,878
		101-200	34.8	1,109
		201-300	4.1	38
		301-500	0.0	0
		501-900	0.0	0
		1-900	32.1	4,025

a/ Less than 0.1 kg/h.
b/ No sampling area available.

Table 27.--Mean CPUE (kg/h) and estimated biomass (t) for rex sole by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.3	32
		101-200	2.1	366
		201-300	2.5	263
		301-500	4.5	626
		501-900	1.6	459
		1-900	2.2	1,746
	Southwest	1-100	0.0	0
		101-200	5.8	325
		201-300	4.4	76
		301-500	1.7	47
		501-900	3.5	212
		1-900	3.5	660
	Southeast	1-100	0.9	32
		101-200	0.1	3
		201-300	2.8	105
		301-500	5.8	205
		501-900	1.2	47
		1-900	2.1	392
	Northwest	1-100	0.0	0
		101-200	0.6	18
		201-300	3.2	39
		301-500	10.2	254
		501-999	0.3	14
		1-999	2.2	324
	Northeast	1-100	0.0	0
		101-200	0.3	15
		201-300	0.8	22
		301-500	2.9	90
		501-900	2.9	186
		1-900	1.6	313
	Bowers Ridge	1-100	0.0*	0*
		101-200	1.9	5
		201-300	1.8	22
		301-500	2.1	30
		501-900	0.0	0
		1-900	0.6	57
Bering Sea				
	Southern	1-100	0.6	27
		101-200	12.8	419
		201-300	17.8	182
		301-500	251.2	3,252
		501-900	26.1	562
		1-900	34.9	4,442

* No sampling area available.

Table 28.--Mean CPUE (kg/h) and estimated biomass (t) for Dover sole by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.0	0
		101-200	0.0 a/	0
		201-300	0.0 a/	4
		301-500	0.4	56
		501-900	1.2	329
		1-900	0.5	389
	Southwest	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	0.0	0
		501-900	0.4	24
		1-900	0.1	24
	Southeast	1-100	0.0	0
		101-200	0.0	0
		201-300	0.1	4
		301-500	0.3	11
		501-900	3.1	121
		1-900	0.7	136
	Northwest	1-100	0.0	0
		101-200	0.0 a/	0 c/
		201-300	0.0 a/	0 c/
		301-500	0.0	0
		501-900	0.1	8
		1-900	0.1	8
	Northeast	1-100	0.0	0
		101-200	0.0	0
		201-300	0.0	0
		301-500	0.5	19
		501-900	2.8	176
		1-900	0.9	195
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	0.0	0
		201-300	0.0	0
		301-500	1.8	26
		501-900	0.0	0
		1-900	0.3	26
Bering Sea				
	Southern	1-100	0.1	4
		101-200	0.2	6
		201-300	0.6	6
		301-500	1.0	14
		501-900	3.8	87
		1-900	0.9	117

a/ Less than 0.1 kg/h.
b/ No sampling area available.
c/ Less than 0.5 t.

Table 29.--Mean CPUE (kg/h) and estimated biomass (t) for flathead Sole by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	2.2	218
		101-200	2.6	514
		201-300	0.5	56
		301-500	0.1	12
		501-900	0.0 a/	16
		1-900	0.9	816
	Southwest	1-100	6.8	168
		101-200	3.0	174
		201-300	1.2	21
		301-500	0.1	2
		501-900	0.2	15
		1-900	2.0	380
	Southeast	1-100	1.1	39
		101-200	0.2	9
		201-300	0.0 a/	0 c/
		301-500	0.0	0
		501-900	0.0	0
		1-900	0.2	48
	Northwest	1-100	0.3	10
		101-200	2.1	61
		201-300	1.7	25
		301-500	0.0	0
		501-900	0.0	0
		1-900	0.6	96
	Northeast	1-100	0.0	0
		101-200	4.4	270
		201-300	0.3	8
		301-500	0.0 a/	10
		501-900	0.0	1
		1-900	1.2	289
	Bowers Ridge	1-100	0.0 b/	0 b/
		101-200	0.0	0
		201-300	0.2	2
		301-500	0.0	0
		501-900	0.0	0
		1-900	0.0 a/	2
Bering Sea				
	Southern	1-100	2.5	120
		101-200	7.1	232
		201-300	26.7	318
		301-500	1.7	24
		501-900	0.0	0
		1-900	5.1	694

a/ Less than 0.1 kg/h.
b/ No sampling area available.
c/ Less than 0.5 t.

Table 30.--Mean CPUE (kg/h) and estimated biomass (t) of skates by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	6.4	757
		101-200	21.6	4,197
		201-300	30.0	3,391
		301-500	30.2	4,289
		501-900	16.1	4,805
		1-900	20.3	17,439
	Southwest	1-100	13.4	433
		101-200	13.6	853
		201-300	24.7	500
		301-500	19.8	586
		501-900	10.0	678
		1-900	14.5	3,050
	Southeast	1-100	3.4	118
		101-200	18.4	762
		201-300	37.8	1,319
		301-500	20.5	636
		501-900	18.5	711
		1-900	20.4	3,546
	Northwest	1-100	0.5	15
		101-200	43.3	1,343
		201-300	41.8	549
		301-500	29.9	711
		501-900	23.5	1,382
		1-900	26.2	4,000
	Northeast	1-100	7.3	191
		101-200	23.4	1,211
		201-300	27.2	921
		301-500	60.1	2,303
		501-900	25.1	1,663
		1-900	28.8	6,289
	Bowers Ridge	1-100	0.0[a]	0[a]
		101-200	9.3	28
		201-300	7.6	102
		301-500	3.5	53
		501-900	5.5	371
		1-900	5.5	554
Bering Sea				
	Southern	1-100	0.0[b]	0[c]
		101-200	63.0	2,100
		201-300	10.0	99
		301-500	62.7	855
		501-900	5.5	121
		1-900	24.4	3,175

a/ No sampling area available.
b/ Less than 0.1 kg/h.
c/ Less than 0.5 t.

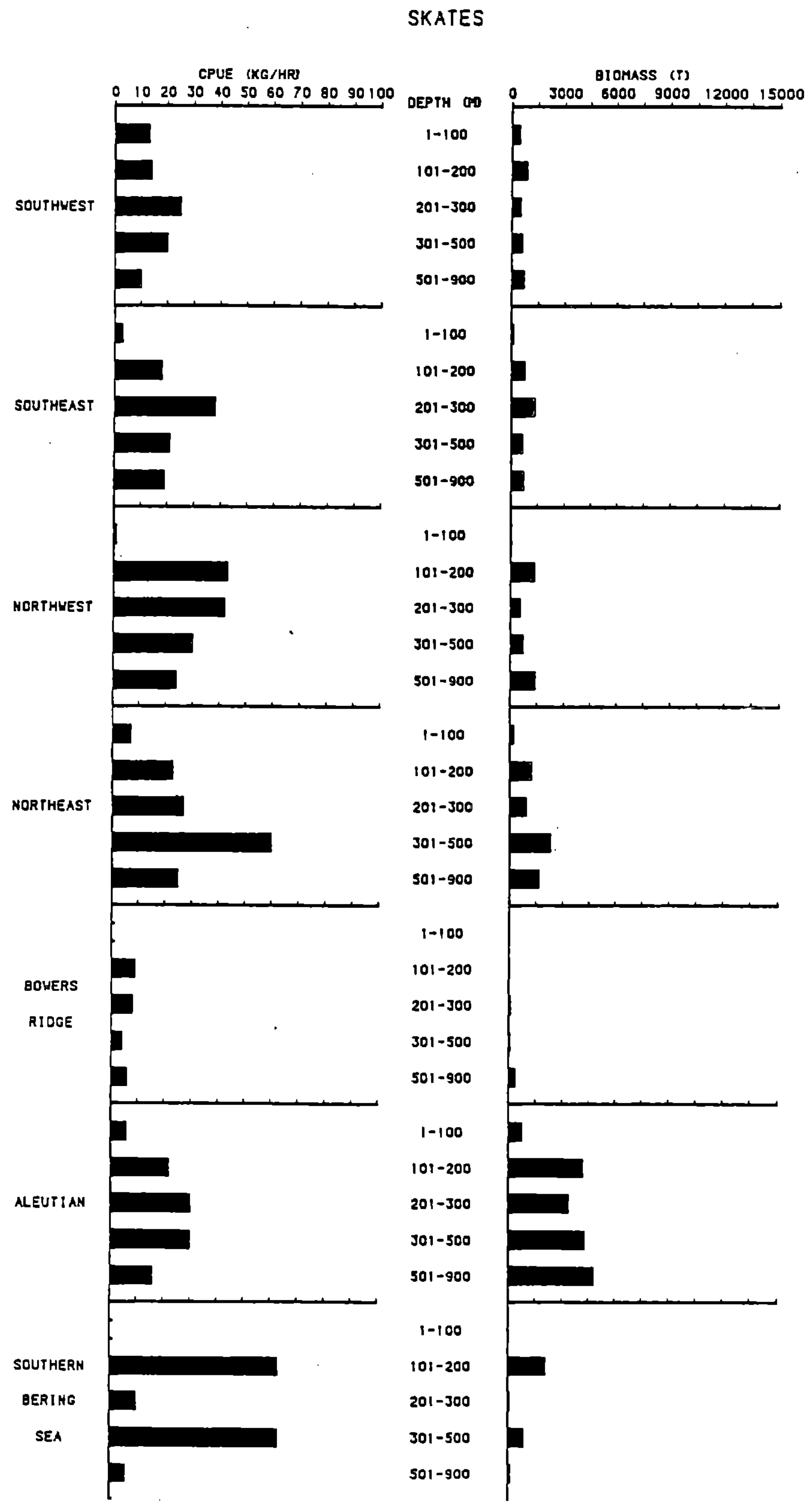

Figure 69.--Mean CPUE (kg/h) and estimated biomass (t) for skates by area, subarea, and depth interval.

Table 31.--Mean CPUE (kg/h) and estimated biomass for red squid by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	4.5	524
		101-200	7.5	1,359
		201-300	74.5	8,690
		301-500	20.2	2,847
		501-900	1.9	572
		1-900	16.3	13,992
	Southwest	1-100	0.0	0
		101-200	20.3	1,139
		201-300	349.5	7,014
		301-500	40.8	1,240
		501-900	4.2	281
		1-900	47.8	9,674
	Southeast	1-100	11.4	392
		101-200	0.0	0
		201-300	5.4	208
		301-500	23.2	824
		501-900	4.1	157
		1-900	8.2	1,581
	Northwest	1-100	0.0	0
		101-200	2.4	77
		201-300	91.7	1,243
		301-500	17.3	433
		501-900	0.1	8
		1-900	11.2	1,761
	Northeast	1-100	5.3	132
		101-200	2.4	143
		201-300	5.3	187
		301-500	6.7	235
		501-900	1.5	104
		1-900	3.6	801
	Bowers Ridge	1-100	0.0[a]	0[a]
		101-200	0.1	0[b]
		201-300	3.1	38
		301-500	7.9	115
		501-900	0.4	22
		1-900	1.8	175
Bering Sea				
	Southern	1-100	0.0	0
		101-200	1.6	59
		201-300	6.7	82
		301-500	3.0	33
		501-900	11.1	252
		1-900	3.3	426

a/ No sampling area available.
b/ Less than 0.5 t.

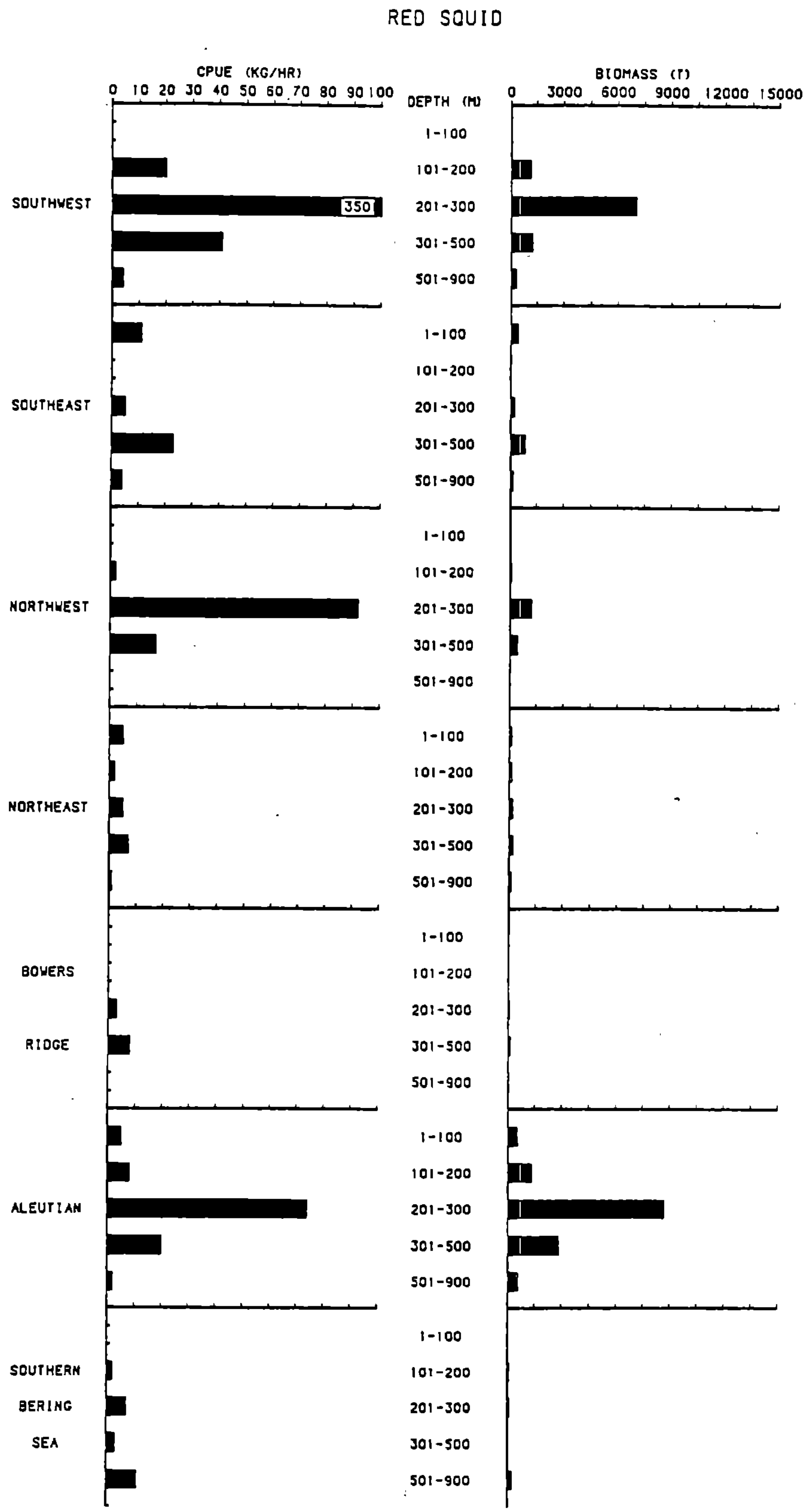

Figure 70.-Mean CPUE (kg/h) and estimated biomass (t) for red squid by area, subarea, and depth interval.

estimated biomass for the Aleutian Islands area was also located in the southwest subarea.

Although the size composition of red squid varied within the survey subareas, the largest mean size occurred in the subarea of highest abundance (southwest), where the size (mantle length) of the principal mode ranged from 22 to 33 cm (Fig. 71).

Golden king crab (Lithodes aequispina)

Although otter trawls equipped with roller gear are usually not considered a good sampling tool for estimating the abundance of crab, the mean catch rates can be useful in providing information on the relative abundance. Golden king crab were distributed in all subareas of the survey area. Highest mean catch rates were found in the western portion of the Aleutian Islands area primarily in the southwest subarea, 7 kg/h, and in the l0l- to 200-m depth interval, 16 kg/h (Table 32, Fig. 72).

Temperature Observations

During the survey, water temperature information was collected at selected stations using expendable bathythermograph temperature probes (XBT's). Surface water temperatures were collected at 422 stations and bottom water temperatures were collected at 359 stations (Appendix 3). The surface temperatures recorded throughout the survey ranged from 5.6 to l0.0°C. The considerably wide range of temperatures were caused by the S-month survey time period as well as the wide geographical area covered. Other contributing factors were the strong tides and currents characteristic of the Aleutian Islands region.

Mean surface and bottom temperatures are presented by subarea and depth interval in Table 33. Bottom temperatures decreased with increasing depth

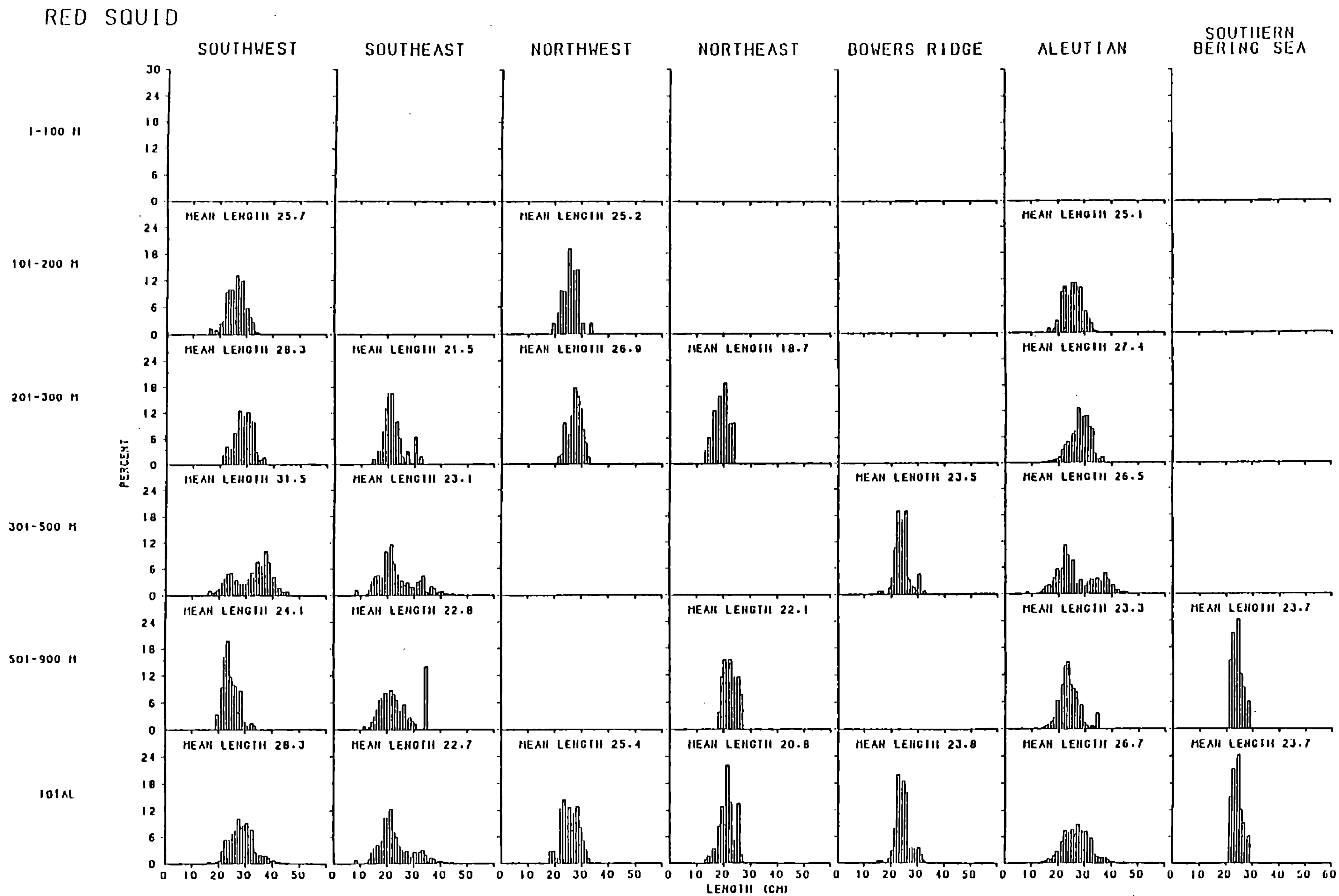

Figure 71.--Size composition of red squid (mantle length), unsexed, by survey area, subarea, and depth zone.

Table 32.--Mean CPUE (kg/h) and estimated biomass for golden king crab by area, subarea, and depth interval.

Area	Subarea	Depth (m)	CPUE (kg/h)	Biomass (t)
Aleutian				
		1-100	0.4	56
		101-200	7.7	1,479
		201-300	5.0	554
		301-500	2.6	357
		501-900	0.8	249
		1-900	3.2	2,695
	Southwest	1-100	0.2	6
		101-200	16.0	1,002
		201-300	11.0	218
		301-500	2.8	87
		501-900	1.4	98
		1-900	6.8	1,411
	Southeast	1-100	0.0	0
		101-200	2.0	71
		201-300	1.6	58
		301-500	4.1	132
		501-900	1.0	37
		1-900	1.8	298
	Northwest	1-100	1.4	50
		101-200	10.9	307
		201-300	16.1	192
		301-500	2.9	74
		501-900	1.2	73
		1-900	4.6	696
	Northeast	1-100	0.0	0
		101-200	1.8	95
		201-300	1.8	56
		301-500	1.6	56
		501-900	0.5	32
		1-900	1.1	239
	Bowers Ridge	1-100	0.0*	0*
		101-200	1.5	4
		201-300	2.4	30
		301-500	0.5	8
		501-900	0.1	9
		1-900	0.5	51
Bering Sea				
	Southern	1-100	0.0	0
		101-200	0.1	2
		201-300	2.1	16
		301-500	0.9	10
		501-900	0.2	4
		1-900	0.3	32

* No sampling area available.

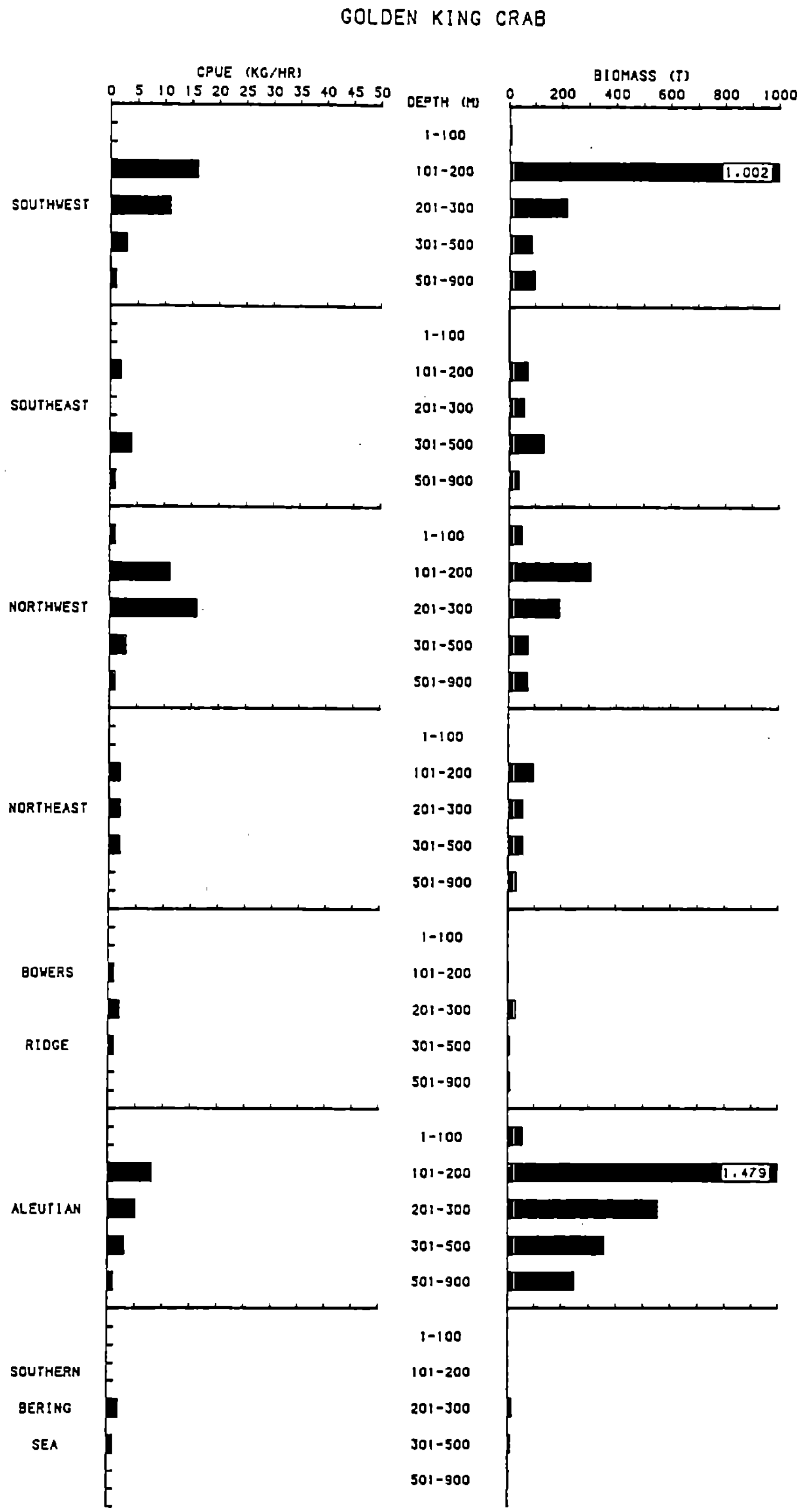

Figure 72.--Mean CPUE (kg/h) and estimated biomass (t) for golden king crab by area, subarea, and depth interval.

Table 33.--Average surface and sea floor water temperatures by depth and subarea collected during the 1983 Aleutian Island survey.

Area	Subarea	Depth (m)	Average temperature (°C) Surface (n)	Bottom (n)
Aleutian		1-100	6.8 (22)	5.0 (17)
		101-200	7.3 (141)	4.8 (115)
		201-300	7.1 (87)	4.6 (82)
		301-500	7.3 (57)	3.9 (46)
		501-900	7.2 (72)	3.5 (63)
		1-900	7.2 (379)	4.4 (323)
	Southwest	1-100	6.9 (4)	4.8 (5)
		101-200	7.5 (35)	4.7 (35)
		201-300	7.4 (24)	4.6 (23)
		301-500	7.6 (23)	4.1 (13)
		501-900	7.6 (14)	3.5 (10)
		1-900	7.5 (100)	4.4 (86)
	Southeast	1-100	8.1 (1)	-
		101-200	7.0 (25)	5.0 (25)
		201-300	7.0 (24)	4.9 (21)
		301-500	7.3 (11)	4.1 (11)
		501-900	7.9 (9)	3.6 (9)
		1-900	7.2 (70)	4.6 (66)
	Northwest	1-100	6.4 (7)	4.8 (5)
		101-200	6.5 (18)	4.3 (13)
		201-300	6.8 (14)	4.3 (12)
		301-500	6.6 (7)	3.8 (7)
		501-900	6.6 (19)	3.4 (17)
		1-900	6.6 (65)	4.0 (54)
	Northeast	1-100	6.8 (10)	5.3 (7)
		101-200	7.6 (61)	5.1 (40)
		201-300	7.2 (23)	4.5 (24)
		301-500	7.5 (11)	3.9 (10)
		501-900	7.3 (19)	3.6 (16)
		1-900	7.4 (124)	4.6 (97)
	Bowers Ridge	101-200	6.9 (2)	3.7 (2)
		201-300	6.9 (2)	3.8 (2)
		301-500	6.9 (5)	3.5 (5)
		501-900	7.2 (11)	3.4 (11)
		1-900	7.1 (20)	3.5 (20)
Bering Sea				
	Southern	1-100	8.0 (17)	6.3 (13)
		101-200	7.9 (12)	5.2 (10)
		201-300	7.9 (8)	4.6 (8)
		301-500	7.2 (3)	3.8 (2)
		501-900	7.7 (3)	3.5 (3)
		1-900	7.9 (43)	5.2 (36)

and generally were higher on the south side of the island chain than the north side and were higher in the east than in the west. The lowest bottom temperatures were recorded at Bowers Ridge. In comparison with the bathymetric profile obtained from the 1980 survey, bottom temperatures were somewhat higher in 1983 (about 0.3°C on the average) at depths less than 300 m, but there were no appreciable differences at depths greater than 300 m.

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APPENDIX 1

Length-Weight Data

Length-weight data by species collected throughout the Aleutian Islands are presented in Appendix 1. All weight measurements are recorded in grams, all length measurements in centimeters, and the fitted least squares regression equations are given. in millimeters.

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Length-weight relationships were examined for each species, by sex, using linear least squares regression techniques. The resulting estimated regression equation and coefficients are as follows:

Weight (grams) = (a) Length $(mm)^b$

Species	Sex	a	b
Walleye pollock	male	.000029727	2.770
	female	.000026428	2.798
	total	.000027646	2.782
Atka mackerel	male	.00000000521	4.300
	female	.00000000288	4.384
	total	.00000000282	4.394
Pacific cod	male	.000003103	3.208
	female	.000002588	3.237
	total	.000002813	3.224
Pacific ocean perch	male	.000007816	3.085
	female	.000006939	3.106
	total	.000007245	3.099
Sablefish	male	.000000917	3.376
	female	.000002065	3.251
	total	.000001293	3.322
Northern rockfish	male	.000031987	2.858
	female	.000043033	2.818
	total	.0000185	2.964
Shortraker rockfish	male	.000006821	3.145
	female	.000005297	3.186
	total	.000006012	3.165
Shortspine thornyhead	male	.000002857	3.253
	female	.000002238	3.293
	total	.000002546	3.273
Greenland turbot	male	.000001016	3.341
	female	.000000765	3.395
	total	.000000368	3.502
Rock sole	male	.000010724	2.991
	female	.000005368	3.124
	total	.000003784	3.182
Red squid	total	.0017308	2.292

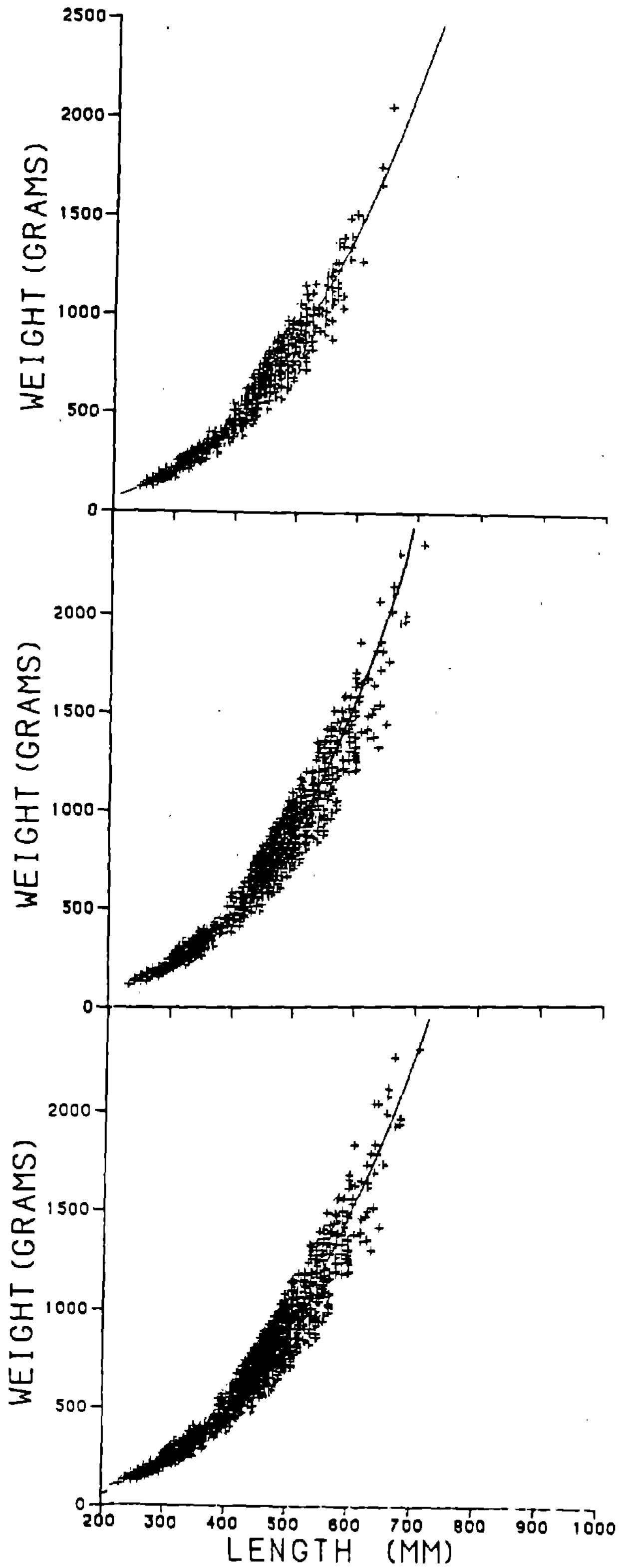
Walleye pollock

Total survey area

Male

Female

Total



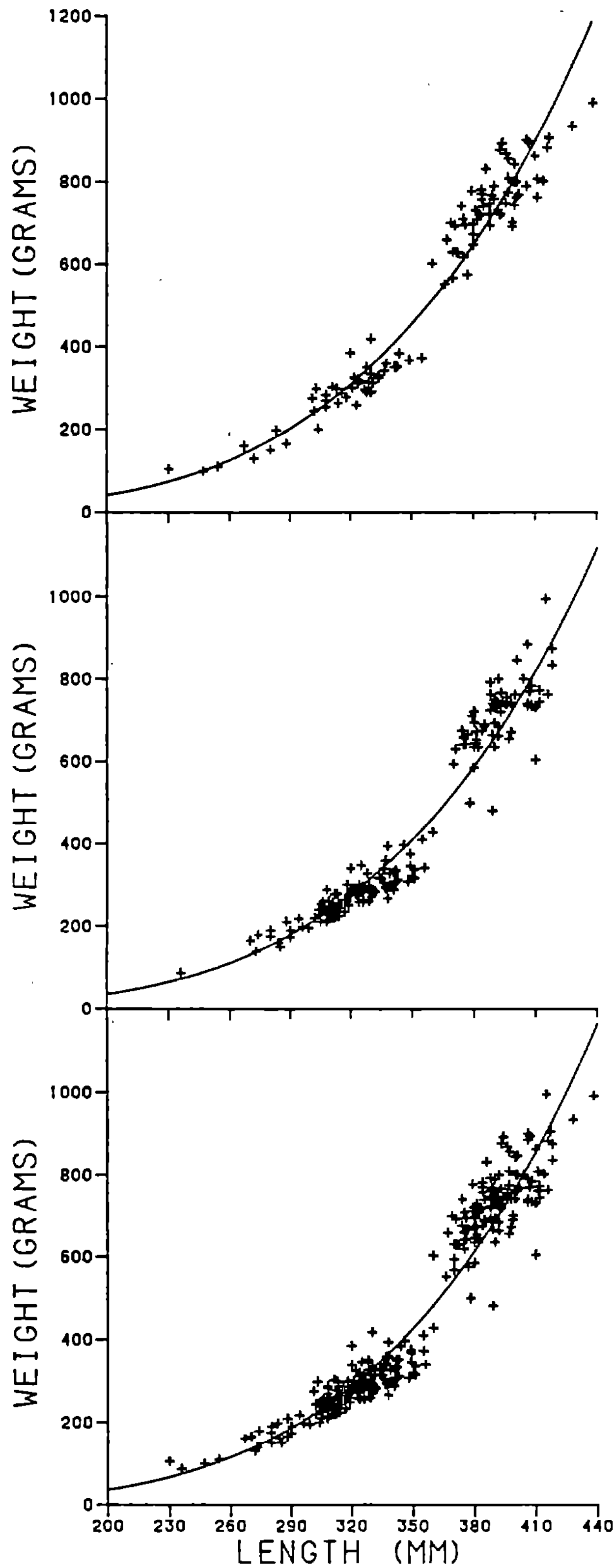
Atka mackerel

Total survey area

Male

Female

Total



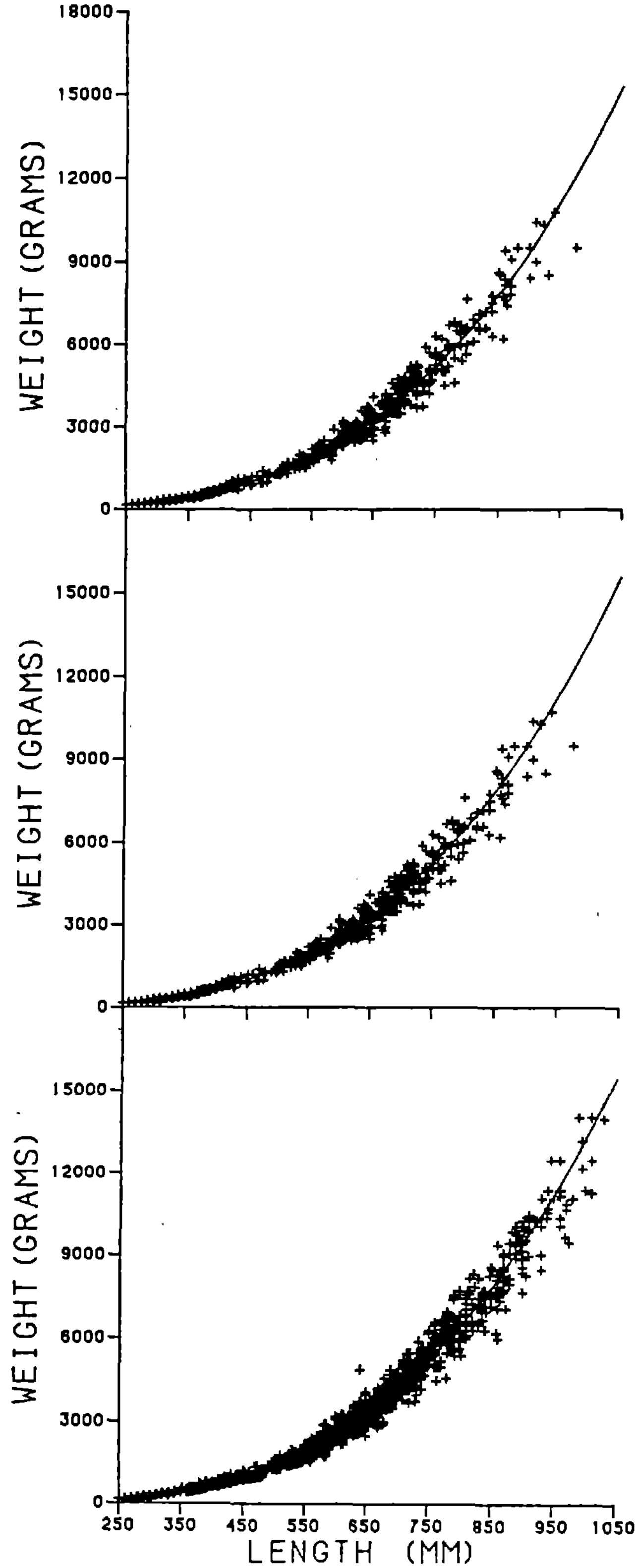
Pacific cod

Total survey area

Male

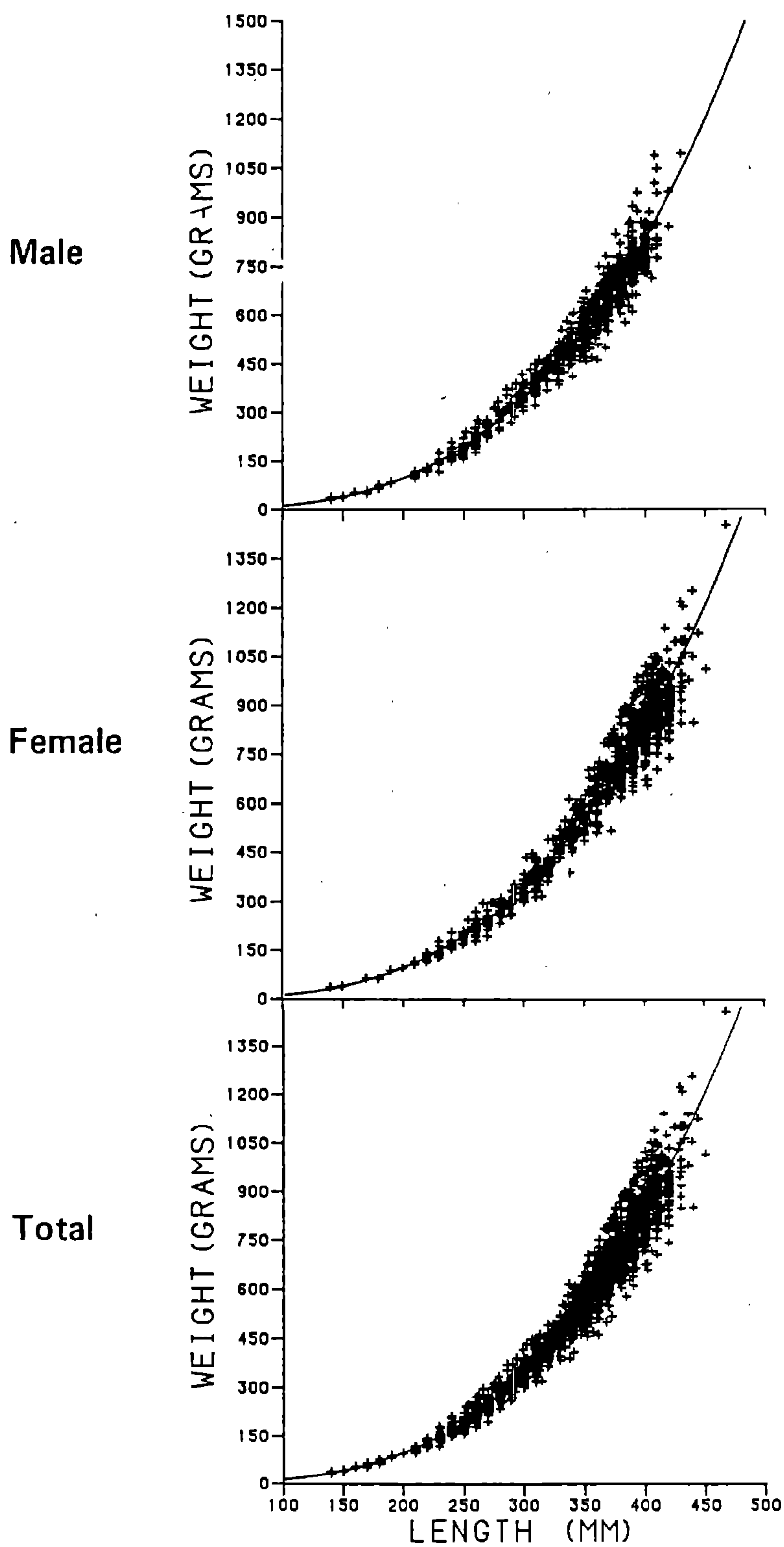
Female

Total



Pacific ocean perch

Total survey area



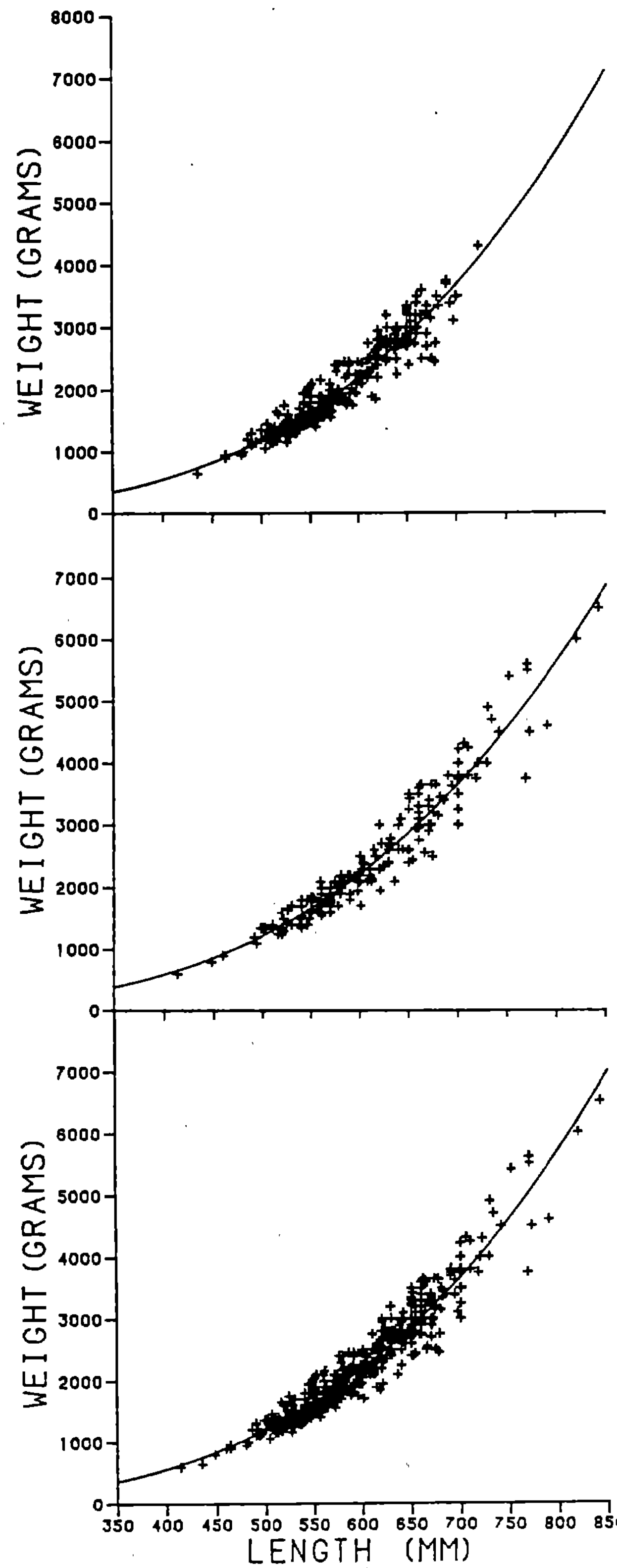
Sablefish

Total survey area

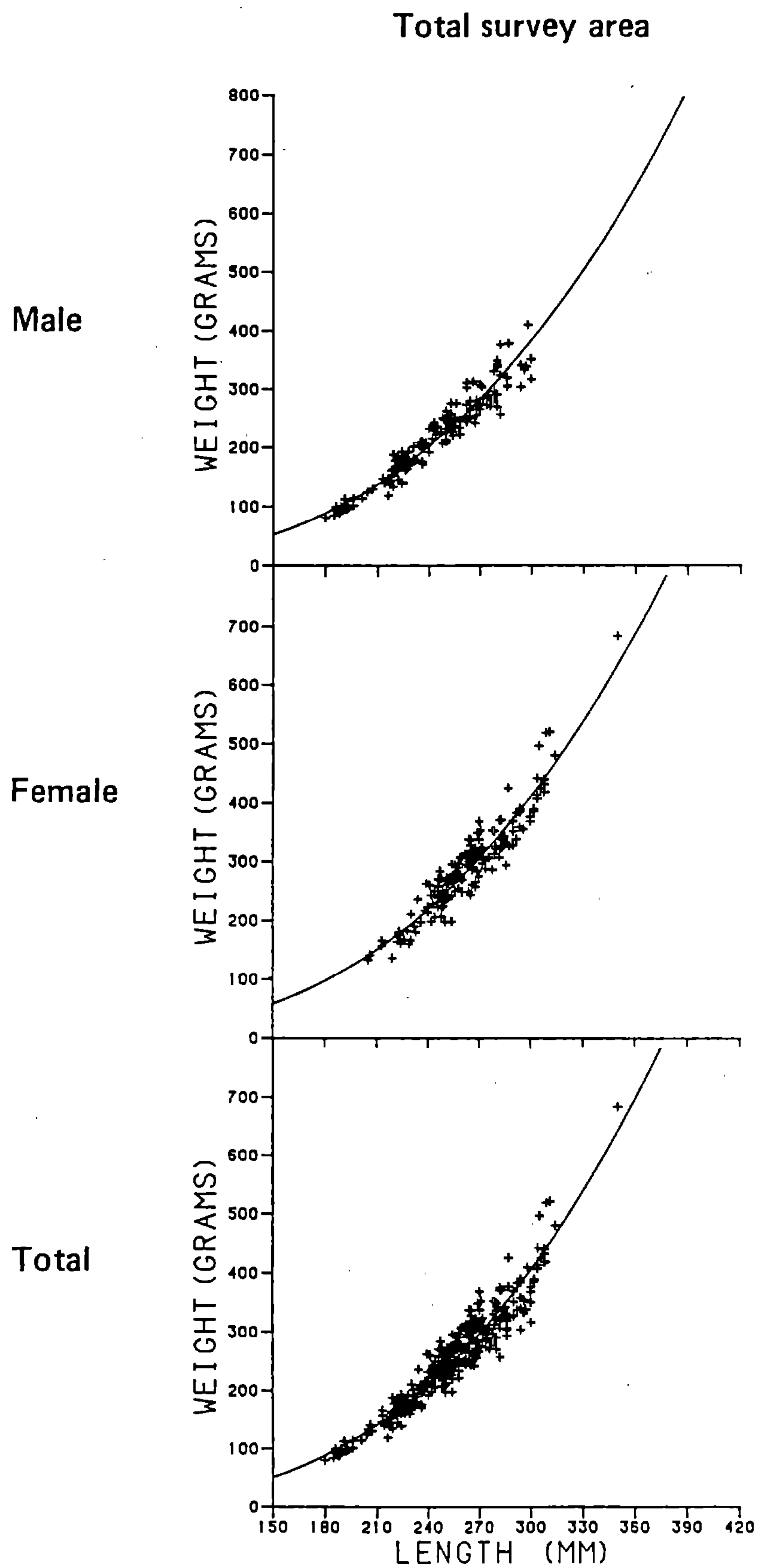
Male

Female

Total

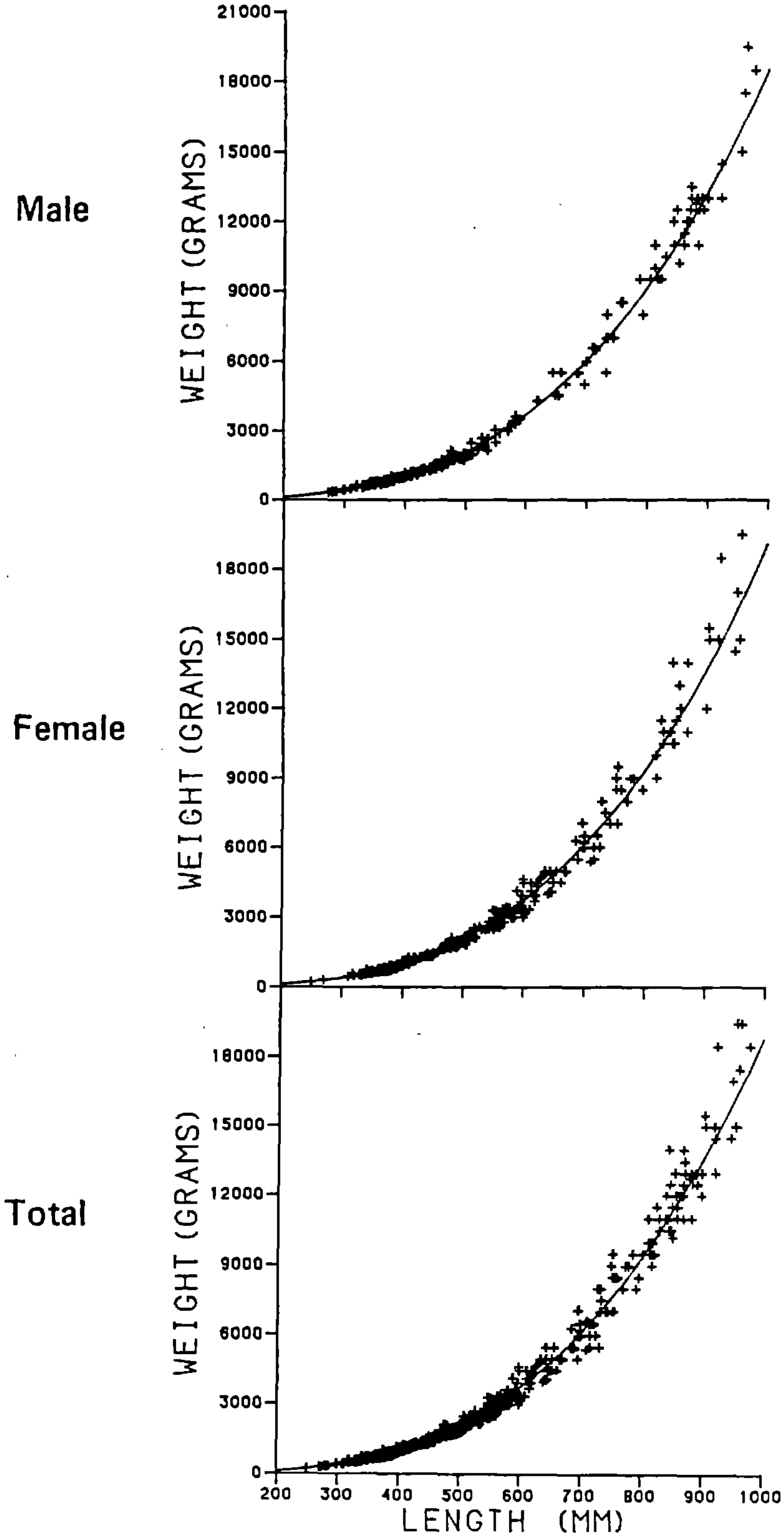


Northern rockfish



Shortraker rockfish

Total survey area



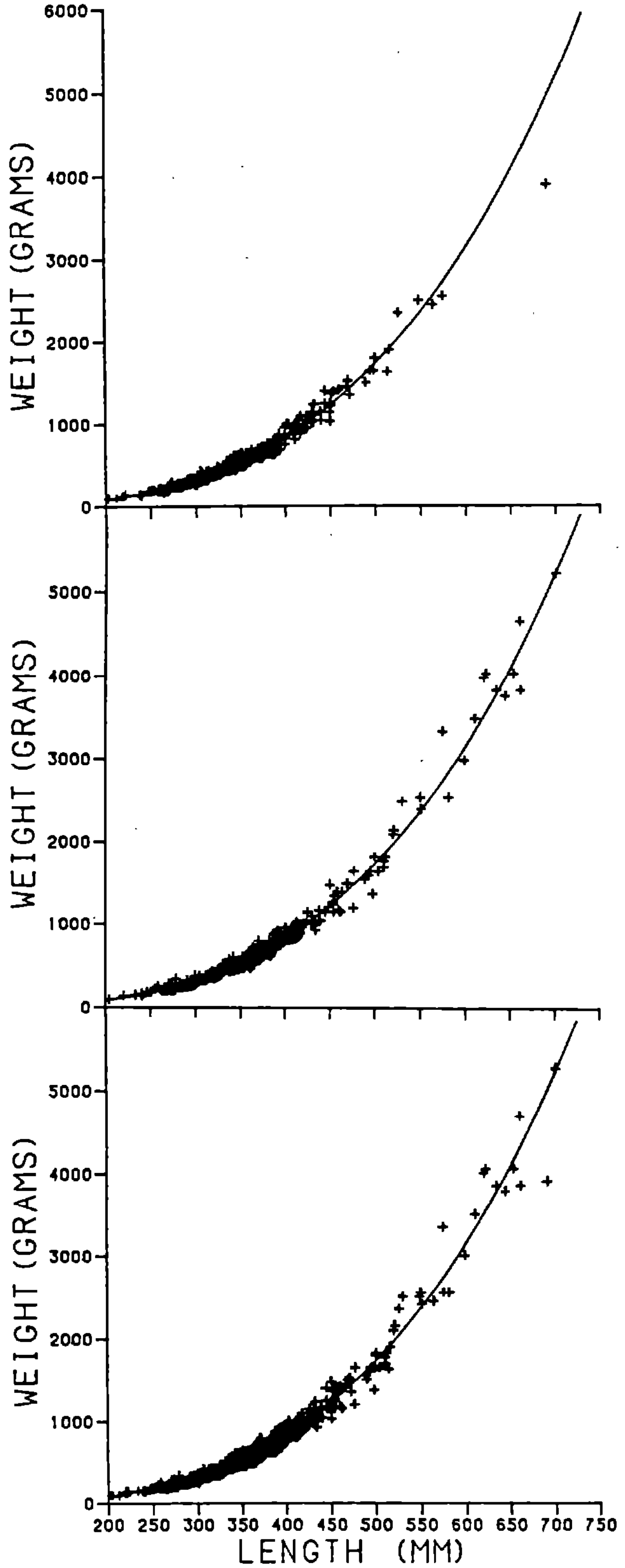
Shortspine thornyhead rockfish

Total survey area

Male

Female

Total



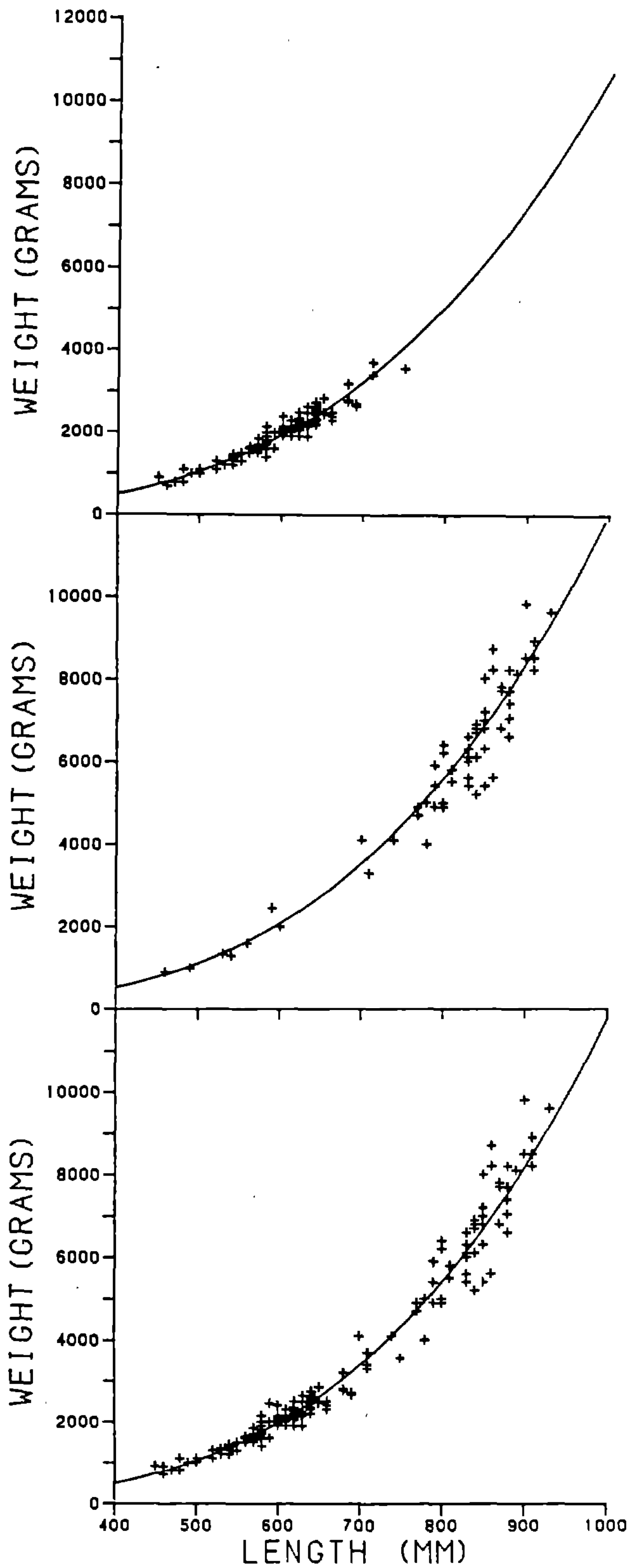
Greenland turbot

Total survey area

Male

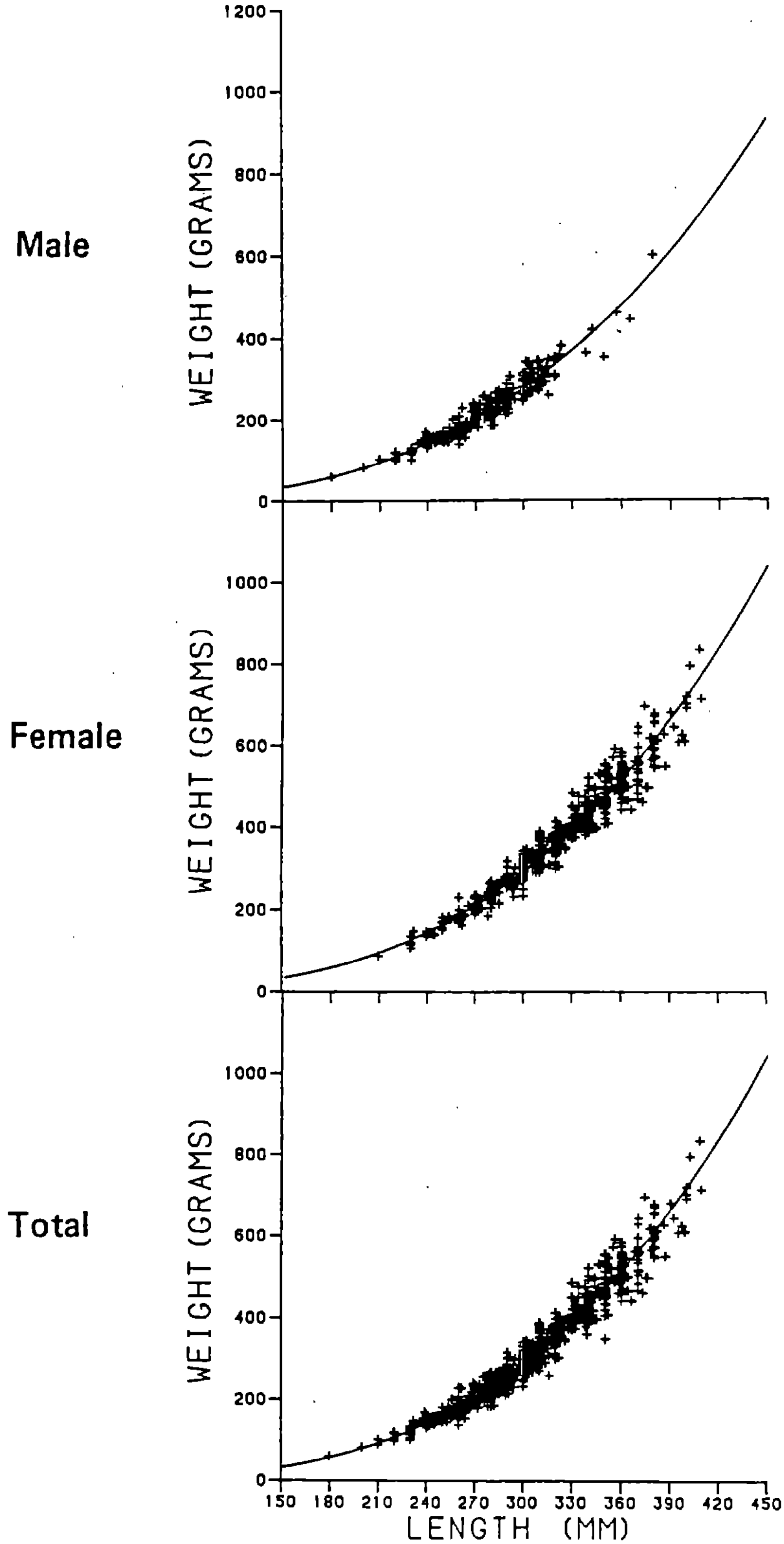
Female

Total



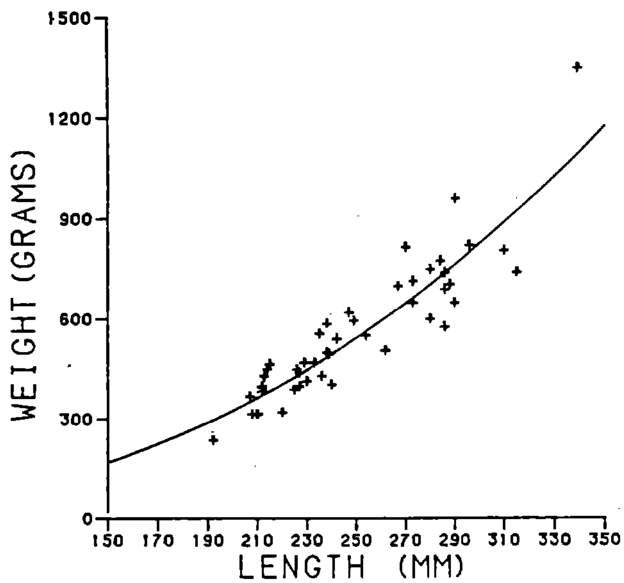
Rock sole

Total survey area



Red squid

Both sexes



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APPENDIX 2

Sample Error

The precision of the biomass estimates for most of the species discussed in this report are presented in Appendix 2 as sample error. Sample error is calculated as:

[(95% upper confidence interval-mean estimate)/(mean estimate)] X 100

The confidence intervals are symmetrically distributed about the mean.

Species	Aleutian biomass	sample error	S. Bering Sea biomass	sample error
Atka mackerel	306,782	59.6	10	156.4
Walleye pollock	242,678	70.6	245,095	160.3
Pacific cod	136,887	38.1	34,503	53.6
Pacific ocean perch	144,079	39.2	97,479	182.7
Sablefish	68,543	109.0	9,167	95.6
Giant grenadier	381,219	28.7	1,766	--
Northern rockfish	44,458	70.5	1,516	109.3
Shortraker rockfish	27,914	67.4	13,080	308.3
Shortspine thornyhead	15,138	17.7	1,414	37.1
Rougheye rockfish	20,581	59.5	2,829	375.1
Greenland turbot	49,833	45.3	14,033	622.5
Arrowtooth flounder	39,888	28.3	8,971	34.4
Rock sole	19,316	188.2	1,147	31.1
Pacific halibut	17,771	22.3	3,607	59.2
Flathead sole	816	334.2	574	132.8
Dover sole	389	70.9	113	203.4
Rex sole	1,746	40.3	4,415	246.2
Red squid	13,993	77.6	426	72.5
Red king crab	218	95.2	0	0.0

APPENDIX 3

Water Temperature Data

Surface and bottom water temperature data by vessel and station are presented in Appendix 3. All water temperature measurements are recorded in degrees Celsius.

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HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP (DEG C)	GEAR TEMP. (DEG C)
1	8/17/83	54	36	165	13	47	9	0.50	1.51	0	8.0	6.9
2	8/17/83	54	41	165	21	80	11	0.50	1.52	0	8.7	4.9
3	8/17/83	54	45	165	25	115	13	0.50	1.43	0	8.7	4.7
4	8/17/83	54	41	165	35	163	16	0.50	1.24	0	9.2	4.0
5	8/18/83	54	8	166	20	54	9	0.50	1.45	0	8.5	4.7
6	8/19/83	54	13	166	11	95	11	0.25	0.74	0	8.4	4.6
7	8/19/83	54	9	166	19	72	14	0.50	1.48	0	8.8	
8	8/19/83	54	7	166	16	52	15	0.50	1.56	0	8.5	
9	8/19/83	54	14	166	10	125	18	0.25	0.78	0	8.7	4.2
10	8/20/83	53	46	167	6	47	9	0.50	1.44	0	9.0	6.5
11	8/20/83	53	47	167	15	91	11	0.50	1.35	0	8.5	5.4
12	8/21/83	53	47	167	16	80	7	0.50	1.56	0	5.0	5.5
13	8/21/83	53	40	167	19	47	10	0.33	0.87	0	8.7	6.2
14	8/22/83	53	24	168	29	45	7	0.25	0.86	0	6.3	6.2
15	8/22/83	53	22	168	30	49	8	0.50	1.50	0	6.3	6.3
16	8/22/83	53	21	168	31	51	9	0.50	1.47	0	7.2	6.2
17	8/22/83	53	22	168	26	20	11	0.50	1.50	0	8.5	6.5
18	8/22/83	53	22	168	33	48	13	0.47	1.32	0	8.2	6.1
19	8/22/83	53	23	168	40	86	15	0.33	0.91	0	7.9	4.7
20	8/22/83	53	23	168	43	114	16	0.50	1.47	0	7.5	5.1
21	8/23/83	53	4	169	57	81	9	0.50	1.48	0	7.1	5.6
22	8/23/83	53	6	169	54	96	12	0.50	1.49	0	8.9	5.0
23	8/23/83	53	1	169	60	72	14	0.50	1.42	0	8.9	5.2
24	8/24/83	52	53	169	54	40	8	0.50	1.46	0	6.6	5.9
25	8/24/83	53	2	169	59	80	15	0.45	1.32	0	7.1	4.6
26	8/25/83	52	26	173	52	77	13	0.50	1.50	0	9.0	4.9
27	8/25/83	52	25	173	49	76	15	0.50	1.47	0	9.0	
28	8/25/83	52	17	173	44	107	19	0.50	1.46	0	9.7	4.1
29	8/26/83	52	26	173	54	96	9	0.50	1.11	0	8.6	4.9
30	8/26/83	52	30	173	31	113	11	0.16	0.44	0	7.9	4.4
31	8/26/83	52	17	173	7	84	15	0.50	1.40	0	9.6	5.3
32	8/26/83	52	16	172	59	78	16	0.25	0.73	0	10.0	4.6
33	8/27/83	52	35	172	26	123	8	0.50	1.40	0	6.6	5.0
34	8/27/83	52	36	172	25	140	10	0.50	1.45	0	6.8	4.5
35	8/27/83	52	15	172	59	81	14	0.17	0.51	0	9.6	
36	8/28/83	52	16	174	24	83	13	0.25	0.67	0	8.3	
37	8/30/83	52	16	174	28	86	8	0.33	0.94	0	8.7	7.7
38	8/30/83	52	25	173	53	71	13	0.25	0.78	0	9.4	
39	8/30/83	52	20	173	50	64	14	0.25	0.75	0	9.4	
40	8/30/83	52	25	173	52	73	16	0.25	0.75	0	9.4	
41	8/30/83	52	25	173	53	73	17	0.25	0.74	0	9.7	
42	8/31/83	52	50	171	30	120	8	0.50	1.45	0	7.0	4.7
43	8/31/83	52	49	171	35	123	9	0.20	0.39	0	6.9	4.8
44	8/31/83	52	51	171	21	109	12	0.50	1.43	0	7.0	5.1
45	8/31/83	52	50	171	24	105	14	0.50	1.51	0	6.9	
46	9/ 1/83	52	42	170	46	87	8	0.33	1.09	0	6.9	5.1
47	9/ 1/83	52	42	170	50	76	9	0.34	1.02	0	6.9	5.7
48	9/ 1/83	52	44	170	46	159	11	0.50	1.06	0	6.3	5.3
49	9/ 1/83	52	46	170	39	104	13	0.50	1.74	0	6.4	5.3
50	9/ 1/83	52	48	170	54	364	16	0.50	1.41	0	7.6	

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
51	9/ 2/83	53	36	168	12	65	8	0.10	0.30	0	7.1	
52	9/ 2/83	53	37	168	11	65	9	0.11	0.40	0	7.1	
53	9/ 2/83	53	36	168	13	66	10	0.23	0.73	0	7.0	
54	9/ 3/83	54	7	166	21	57	8	0.20	0.56	0	8.2	
55	9/ 3/83	54	7	166	21	57	9	0.33	0.97	0	8.5	
56	9/ 3/83	54	8	166	20	59	10	0.50	1.44	0	8.6	
57	9/ 3/83	54	7	166	19	56	12	0.50	1.47	0	8.4	
58	9/ 3/83	54	8	166	21	58	13	0.50	1.48	0	8.7	
59	9/ 4/83	54	13	165	51	25	8	0.25	0.74	0	8.4	
60	9/ 4/83	54	12	165	48	36	9	0.50	1.57	0	8.9	
61	9/ 4/83	54	8	166	21	54	12	0.50	1.49	0	8.9	6.9
62	9/ 4/83	54	7	166	20	55	13	0.50	1.46	0	8.9	6.9
63	9/ 4/83	54	8	166	22	55	14	0.50	1.48	0	8.9	6.9

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
1	7/28/83	51	47	182	35	76	7	0.12	0.32	132		
2	7/28/83	51	46	182	41	109	10	0.50	1.45	132	5.7	4.9
3	7/28/83	51	44	182	40	308	19	0.50	1.40	135	6.5	
4	7/28/83	51	44	182	41	206	21	0.50	1.44	134	6.1	4.1
5	7/29/83	51	50	182	23	0	0	0.00	0.00	0		
6	7/29/83	51	50	182	24	75	1	0.16	0.47	132	6.6	4.8
7	7/29/83	51	46	182	16	135	4	0.50	1.48	133	7.8	4.6
8	7/29/83	51	48	182	15	83	8	0.50	1.47	132	7.2	4.9
9	7/29/83	51	50	182	16	71	10	0.00	0.00	132		
10	7/29/83	51	41	181	44	71	15	0.50	1.13	132	6.1	4.9
11	7/29/83	51	40	181	42	115	17	0.50	1.30	133	5.7	
12	7/29/83	51	38	181	52	225	21	0.50	1.49	134	6.0	3.7
13	7/30/83	51	34	181	52	406	1	0.50	1.19	135	6.1	
14	7/30/83	51	29	181	21	148	8	0.25	0.67	133	6.9	4.2
15	7/30/83	51	30	181	21	101	10	0.50	1.44	132	6.8	6.2
16	7/30/83	51	26	181	10	112	13	0.50	1.40	133	7.0	4.9
17	7/30/83	51	16	180	51	97	18	0.50	1.59	132	8.4	4.7
18	7/30/83	51	15	180	47	108	22	0.50	1.54	132	8.0	5.2
19	7/30/83	51	15	180	48	143	24	0.50	1.44	133	7.9	4.8
20	7/31/83	51	15	180	48	189	3	0.08	0.33	134	8.2	4.7
21	7/31/83	51	15	180	48	186	4	0.50	1.36	134	8.2	4.7
22	7/31/83	51	13	180	47	344	7	0.50	1.44	135	7.4	3.3
23	7/31/83	51	18	180	37	114	11	0.17	0.49	133	7.4	5.1
24	7/31/83	51	18	180	36	125	13	0.50	1.54	133	8.4	5.4
25	7/31/83	51	18	180	36	81	15	0.50	1.53	132	7.7	5.2
26	8/ 1/83	51	44	181	14	416	1	0.33	0.85	325		
27	8/ 1/83	51	57	181	18	395	7	0.50	1.25	325	5.4	3.4
28	8/ 1/83	52	4	181	28	296	13	0.50	1.71	325		
29	8/ 1/83	52	2	181	18	417	17	0.50	1.31	325	7.0	3.3
30	8/ 1/83	51	51	181	11	373	24	0.50	1.36	325	6.5	3.4
31	8/ 2/83	51	57	181	51	191	6	0.50	1.44	324	6.0	4.3
32	8/ 2/83	51	58	181	49	147	9	0.50	1.44	323	6.0	3.8
33	8/ 2/83	51	56	181	45	54	13	0.50	1.55	321	5.6	4.7
34	8/ 2/83	51	56	181	44	122	18	0.50	1.60	323	6.0	4.8
35	8/ 2/83	51	53	181	39	82	21	0.50	1.34	322	6.5	
36	8/ 2/83	51	54	181	51	101	23	0.50	1.55	322	5.8	5.0
37	8/ 3/83	51	40	179	1	234	14	0.15	0.29	414	6.9	3.7
38	8/ 3/83	51	43	178	52	318	18	0.09	0.00	415	6.7	
39	8/ 3/83	51	40	178	32	72	23	0.01	0.00	412		
40	8/ 4/83	51	46	178	10	53	5	0.50	1.60	411	5.8	5.5
41	8/ 4/83	51	47	178	7	84	8	0.50	1.16	412	6.3	4.5
42	8/ 4/83	51	53	177	45	65	15	0.50	1.55	412	6.7	5.7
43	8/ 4/83	51	47	177	40	73	20	0.50	1.70	412	6.2	
44	8/ 4/83	51	49	177	40	44	22	0.50	1.45	411	6.9	5.4
45	8/ 5/83	51	56	177	1	50	5	0.50	1.23	411	6.3	4.8
46	8/ 5/83	51	57	176	51	51	10	0.23	0.67	421	7.2	4.0
47	8/ 5/83	51	56	176	53	110	13	0.50	1.10	423	6.5	4.6
48	8/ 5/83	51	60	176	33	26	17	0.50	1.50	421	6.8	6.0
49	8/ 5/83	52	1	176	22	63	20	0.50	1.38	422	6.6	
50	8/ 5/83	51	54	176	27	78	23	0.50	1.45	422	6.8	5.7

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
51	8/ 6/83	51	56	176	19	105	2	0.50	1.48	422	7.2	5.7
52	8/ 6/83	52	1	176	24	59	5	0.50	1.47	422	6.4	5.8
53	8/ 6/83	52	2	176	19	100	8	0.50	1.52	422	6.6	5.5
54	8/ 6/83	52	4	176	22	375	11	0.50	1.60	425	6.8	3.3
55	8/ 6/83	52	3	176	21	260	14	0.50	1.45	424	7.0	3.8
56	8/ 6/83	52	3	176	23	136	17	0.50	1.11	423	6.3	5.3
57	8/ 7/83	52	10	175	37	81	1	0.50	1.10	422	6.8	
58	8/ 7/83	52	10	175	36	84	3	0.50	0.99	422	7.0	5.0
59	8/ 7/83	52	10	175	23	106	6	0.50	1.39	422	6.4	4.7
60	8/ 7/83	52	9	175	16	114	9	0.50	1.41	423	6.3	5.0
61	8/ 7/83	52	11	175	14	118	12	0.50	1.45	423	6.6	4.3
62	8/ 7/83	52	11	175	15	170	15	0.50	1.40	424	7.0	4.2
63	8/ 7/83	52	9	175	10	75	19	0.50	1.45	422	6.3	
64	8/ 7/83	52	8	175	9	59	20	0.42	1.05	422	6.5	
65	8/ 7/83	52	6	175	11	52	22	0.50	1.69	421	6.5	5.8
66	8/ 8/83	52	6	175	11	40	1	0.05	0.20	421	6.3	
67	8/ 8/83	52	19	174	42	82	6	0.50	1.45	422	7.1	5.0
68	8/ 8/83	52	18	174	41	65	9	0.50	1.17	422	7.1	5.2
69	8/ 8/83	52	18	174	47	120	13	0.50	1.50	423	7.2	5.0
70	8/ 8/83	52	18	174	47	90	15	0.50	1.60	422	7.2	5.4
71	8/ 8/83	52	17	174	51	280	18	0.50	1.47	425	6.7	3.6
72	8/ 8/83	52	13	174	59	150	22	0.50	1.46	423	7.2	4.2
73	8/10/83	51	13	179	1	103	7	0.50	1.65	212	6.1	5.0
74	8/10/83	51	13	178	60	138	12	0.50	1.55	213	6.2	4.6
75	8/10/83	51	13	178	60	180	14	0.60	1.50	214	5.8	4.2
76	8/10/83	51	13	178	59	223	17	0.50	1.36	214	6.1	4.0
77	8/10/83	51	32	178	43	84	24	0.50	1.70	212	5.9	5.3
78	8/11/83	51	32	178	43	116	2	0.50	1.33	213	6.0	5.4
79	8/11/83	51	29	178	38	146	5	0.50	1.45	213	5.9	5.1
80	8/11/83	51	37	178	26	84	14	0.50	1.56	212	6.3	4.1
81	8/12/83	51	32	176	44	204	1	0.26	0.80	224	6.6	4.7
82	8/12/83	51	33	176	44	134	4	0.50	1.48	223	6.2	
83	8/12/83	51	36	176	44	100	6	0.50	1.50	222	6.1	4.8
84	8/12/83	51	29	176	44	385	9	0.50	1.63	225		3.8
85	8/12/83	51	39	176	26	101	16	0.50	1.39	222	6.4	4.9
86	8/12/83	51	38	176	24	118	18	0.50	1.52	223	6.6	4.7
87	8/12/83	51	37	176	23	150	21	0.50	1.42	223	6.6	4.7
88	8/13/83	51	41	175	44	340	2	0.50	1.58	225	6.8	3.7
89	8/13/83	51	43	175	41	203	7	0.38	1.25	224	6.5	4.3
90	8/13/83	51	45	175	42	138	11	0.50	1.50	223	6.6	5.0
91	8/13/83	51	50	175	43	101	14	0.50	1.27	222	6.7	5.0
92	8/13/83	51	52	175	45	64	17	0.50	1.55	222	6.1	5.7
93	8/13/83	51	52	175	40	77	19	0.27	0.63	222	6.2	5.5
94	8/13/83	51	49	175	43	103	21	0.25	0.79	222	6.6	5.2
95	8/13/83	51	48	175	17	143	24	0.50	1.48	223	6.6	4.8
96	8/14/83	51	49	175	16	119	3	0.50	1.39	223	6.5	4.8
97	8/14/83	51	51	175	12	107	5	0.50	1.40	112	6.6	5.2
98	8/14/83	51	53	175	13	90	8	0.50	1.42	222	6.3	4.7
99	8/14/83	51	52	175	5	95	14	0.57	1.59	222	6.6	4.8

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
1	7/15/83	52	55	189	12	99	18	1.00	3.09	121	7.4	4.0
2	7/15/83	52	55	189	11	143	22	1.00	3.41	131	7.9	4.2
3	7/16/83	52	54	189	11	219	1	1.00	3.17	141	8.0	3.8
4	7/16/83	52	54	189	13	327	19	0.60	2.02	151	8.0	3.6
5	7/16/83	52	60	189	16	93	21	0.90	2.80	121	8.3	4.0
6	7/17/83	52	57	188	57	143	1	1.00	2.80	131	7.9	4.1
7	7/17/83	52	51	188	7	219	23	1.00	2.66	141	7.7	4.1
8	7/18/83	52	50	188	8	327	2	1.00	2.55	151	7.9	3.7
9	7/18/83	52	54	187	43	93	18	1.00	3.11	121	7.9	4.2
10	7/18/83	52	51	187	38	137	21	1.00	3.64	131	7.3	4.3
11	7/18/83	52	49	187	32	99	24	1.00	4.11	121	7.7	4.4
12	7/19/83	52	41	187	21	223	19	1.00	3.21	141	7.7	3.9
13	7/19/83	52	36	187	13	355	22	1.00	2.91	151	7.8	3.5
14	7/20/83	52	22	186	58	316	1	0.80	3.04	151	8.2	3.7
15	7/20/83	52	14	186	35	99	19	1.00	3.01	121	8.0	4.6
16	7/20/83	52	12	186	27	132	21	1.00	3.67	131	7.1	4.1
17	7/20/83	52	10	186	17	99	24	1.00	3.60	121	7.6	4.0
18	7/21/83	52	7	186	11	230	2	1.00	3.42	141	7.3	3.8
19	7/21/83	52	18	186	23	49	19	1.00	2.77	111	6.6	5.0
20	7/21/83	52	23	185	51	90	22	1.00	3.24	121	7.1	4.0
21	7/22/83	52	34	185	47	49	1	1.00	3.54	111	7.5	4.3
22	7/22/83	52	29	185	14	355	4	1.00	2.44	151	7.6	3.4
23	7/22/83	52	2	185	15	93	19	0.90	3.02	121	7.6	4.3
24	7/22/83	52	1	185	16	132	23	1.00	3.02	131	7.6	4.1
25	7/23/83	51	59	185	16	198	2	1.00	2.90	141	6.6	3.9
26	7/23/83	52	12	184	47	99	19	0.90	2.98	122	7.4	4.1
27	7/23/83	52	14	184	41	101	21	1.00	3.36	122	7.4	4.2
28	7/23/83	52	16	184	43	132	23	1.00	3.36	132	7.7	4.2
29	7/24/83	52	11	184	34	219	19	1.00	3.42	142	7.3	3.9
30	7/24/83	52	4	184	35	338	21	1.00	3.00	152	7.8	3.4
31	7/25/83	51	56	184	15	344	1	1.00	2.95	152	7.8	3.6
32	7/25/83	51	47	184	21	49	2	0.80	2.11	112	7.3	5.1
33	7/25/83	51	38	184	20	99	19	1.00	3.17	122	7.0	4.3
34	7/25/83	51	40	184	7	62	22	1.00	2.83	122	7.2	4.5
35	7/26/83	51	55	184	6	93	1	1.00	3.07	122	6.7	4.5
36	7/26/83	52	1	184	7	99	3	0.90	2.88	122	7.6	4.5
37	7/26/83	52	4	184	8	93	19	1.00	2.72	122	7.6	4.3
38	7/26/83	52	20	184	13	143	22	1.00	2.98	132	6.3	4.7
39	7/27/83	52	17	184	9	132	1	1.00	2.37	132	6.2	4.2
40	7/27/83	52	14	183	57	82	2	1.00	2.17	122	6.0	4.6
41	7/27/83	52	12	183	53	82	19	1.00	2.59	122	6.1	5.0
42	7/27/83	52	9	183	47	77	21	1.00	2.27	122	6.2	4.9
43	7/27/83	52	4	183	37	90	23	1.00	2.36	122	5.9	5.0
44	7/28/83	51	56	183	25	79	2	0.80	2.67	122	7.5	4.5
45	7/29/83	51	55	183	24	137	19	1.00	3.00	132	7.1	4.7
46	7/29/83	51	59	183	14	99	22	1.00	3.16	122	5.9	4.7
47	7/30/83	51	60	183	7	77	1	0.80	3.05	122	6.5	4.8
48	7/30/83	51	58	183	17	51	19	0.70	2.69	112	6.4	4.9
49	7/30/83	51	57	183	28	132	23	1.00	3.63	132	7.4	4.4
50	7/31/83	52	2	183	33	132	2	1.00	4.05	132	7.9	4.5

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
51	7/31/83	52	6	183	54	355	19	1.00	2.92	152	7.6	3.4
52	7/31/83	51	54	183	25	219	23	1.00	2.88	142	8.5	3.8
53	8/ 1/83	51	56	183	15	327	2	0.90	2.87	152	7.1	3.5
54	8/ 1/83	51	51	180	42	338	19	1.00	3.32	352	6.2	
55	8/ 1/83	52	3	180	54	291	22	1.00	3.68	352	6.8	3.1
56	8/ 2/83	52	9	180	43	234	1	1.00	3.62	342	7.5	3.3
57	8/ 2/83	51	57	180	43	93	19	1.00	3.70	322	6.5	4.0
58	8/ 2/83	51	55	180	40	132	22	1.00	3.98	332	6.1	4.0
59	8/ 3/83	52	9	180	32	137	1	1.00	4.05	332	7.9	4.0
60	8/ 3/83	52	25	180	19	132	3	1.00	3.96	332	8.3	4.2
61	8/ 3/83	52	21	180	33	338	20	1.00	3.17	352	7.9	3.9
62	8/ 3/83	52	16	180	49	355	23	1.00	3.05	352	7.8	3.9
63	8/ 4/83	51	59	180	58	355	2	1.00	3.26	352	7.9	3.2
64	8/ 4/83	52	22	179	55	99	19	1.00	3.60	421	6.5	4.2
65	8/ 4/83	52	18	179	46	126	22	1.00	3.48	431	7.0	4.2
66	8/ 5/83	52	31	179	32	93	1	1.00	3.67	421	7.7	4.0
67	8/ 5/83	52	38	179	24	88	19	1.00	3.85	421	7.1	4.0
68	8/ 5/83	52	47	179	16	93	22	1.00	2.85	421	7.6	4.0
69	8/ 6/83	52	41	179	26	88	1	1.00	2.67	421	7.5	4.1
70	8/ 6/83	52	32	179	40	49	19	1.00	3.53	411	6.9	
71	8/ 6/83	52	32	179	59	201	23	1.00	3.59	441	7.5	4.0
72	8/ 7/83	52	34	179	57	355	2	0.90	3.68	451	7.8	4.3
73	8/ 7/83	52	29	179	33	302	19	1.00	3.02	451	6.5	3.1
74	8/ 7/83	52	22	179	37	327	22	1.00	3.22	451	7.0	3.2
75	8/ 8/83	52	13	179	36	280	1	1.00	2.92	451	6.8	3.3
76	8/ 8/83	52	4	179	43	291	19	0.60	2.28	451	7.1	3.5
77	8/ 8/83	52	9	179	46	121	22	1.00	3.91	431	6.9	4.0
78	8/ 9/83	52	2	179	59	143	1	0.70	2.35	431	7.5	3.7
79	8/10/83	51	39	177	8	99	20	1.00	4.24	221	6.5	4.3
80	8/10/83	51	39	177	27	93	22	1.00	3.88	221	6.5	4.7
81	8/11/83	51	37	177	35	99	1	1.00	4.33	221	6.2	4.3
82	8/11/83	51	36	177	44	93	19	1.00	3.18	221	6.5	4.2
83	8/11/83	51	36	177	44	121	23	0.80	2.89	231	6.7	4.5
84	8/12/83	51	36	177	37	121	1	1.00	3.65	231	6.5	4.7
85	8/12/83	51	37	177	28	121	3	1.00	3.45	231	6.5	5.2
86	8/12/83	51	33	177	12	338	19	1.00	3.12	251	6.2	3.5
87	8/12/83	51	40	177	6	121	21	1.00	4.45	231	6.1	4.3
88	8/13/83	51	35	177	16	143	1	1.00	3.85	231	7.2	4.5
89	8/13/83	51	38	177	26	219	2	1.00	3.39	241	6.8	4.1
90	8/14/83	51	52	174	2	126	19	1.00	3.39	241	6.7	5.0
91	8/14/83	51	53	174	3	89	21	1.00	3.44	222	6.8	5.0
92	8/15/83	52	15	174	54	99	19	1.00	4.03	422	7.6	4.0
93	8/15/83	52	19	174	44	88	22	1.00	3.40	422	8.2	4.8
94	8/15/83	52	24	174	30	77	24	1.00	3.47	422	8.8	4.7
95	8/16/83	52	19	174	45	121	2	1.00	3.51	432	7.6	3.9
96	8/16/83	52	16	174	51	121	19	1.00	3.75	432	7.7	4.0
97	8/16/83	52	20	174	46	190	22	0.60	2.34	442	8.7	4.0
98	8/17/83	52	17	174	50	302	1	1.00	3.21	452	8.9	3.5
99	8/17/83	52	17	172	55	99	19	1.00	3.44	423	9.1	3.8
100	8/17/83	52	18	172	51	143	22	1.00	2.71	433	8.1	3.7

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
101	8/21/83	53	26	168	37	93	19	0.50	1.63	721	7.3	4.2
102	8/21/83	53	25	168	42	88	23	1.00	3.34	721	8.2	5.6
103	6/22/83	53	26	168	37	121	1	0.60	2.39	731	7.7	4.5
104	8/22/83	53	26	168	43	209	19	1.00	3.71	741	7.5	4.0
105	8/22/83	53	22	168	53	344	22	1.00	3.41	751	7.7	3.3
106	6/23/83	53	10	168	56	121	1	1.00	3.35	731	7.0	4.4
107	8/23/83	53	6	169	32	121	19	1.00	2.53	731	6.7	5.0
108	8/23/83	53	12	169	40	219	22	0.70	2.45	741	6.4	3.5
109	6/24/83	53	12	169	12	355	2	1.00	3.14	751	7.6	3.7
110	8/24/83	53	3	170	27	219	19	1.00	2.58	443	7.3	3.7
111	6/24/83	52	54	170	40	338	22	1.00	3.40	453	8.1	3.4
112	6/25/83	52	50	170	53	355	1	1.00	3.24	453	6.6	2.4
113	8/25/83	52	57	171	18	219	19	0.70	2.18	443	7.1	4.1
114	8/25/83	52	52	171	42	355	22	0.75	2.29	453	6.7	3.0
115	8/26/83	52	39	171	45	344	1	1.00	3 16	453	8.8	3.4
116	8/26/83	52	31	172	35	219	19	1.00	3.30	443	7.7	3.2
117	8/26/83	52	32	172	38	344	22	1.00	2.77	453	7.4	3.2
118	8/27/83	52	22	172	50	338	1	0.20	0.56	453	8.6	3.5
119	8/27/83	51	59	172	43	93	19	1.00	3.23	423	7.4	4.8
120	8/27/83	51	59	172	42	126	22	1.00	2.85	433	9.4	5.1
121	8/28/83	52	7	172	35	77	1	1.00	3.57	423	6.8	5.0
122	8/28/83	52	14	172	12	219	3	0.80	2.06	443	7.7	4.2
123	8/28/83	51	57	173	14	99	19	1.00	3.37	423	9.3	4.7
124	9/23/83	51	47	182	33	93	20	1.00	3.83	123	9.3	4.5
125	9/23/83	51	48	182	21	126	23	1.00	3.81	133	8.4	4.8
126	9/24/83	51	49	182	23	87	1	1.00	3.81	123	8.3	5.2
127	9/24/83	51	44	182	20	328	19	1.00	3.51	153	7.9	3.5
128	9/24/83	51	45	162	12	115	22	0.80	3.00	133	6.4	5.3
129	9/24/83	51	45	181	60	77	24	1.00	3.36	123	9.4	5.3
130	9/25/83	51	40	181	41	115	2	1.00	3.24	133	9.1	4.9
131	9/25/63	51	26	181	32	339	19	0.68	2.39	153	8.2	
132	9/25/83	51	28	181	29	219	21	1.00	3.20	143	7.9	4.3
133	9/25/83	51	31	181	28	120	24	1.00	3.25	133	7.8	5.2
134	9/26/83	51	31	181	25	93	2	1.00	3.63	123	8.4	5.0
135	9/26/83	51	14	180	51	208	20	1.00	2.83	143	9.3	4.1
136	9/26/83	51	15	180	51	120	21	1.00	3.26	133	9.0	4.7
137	9/26/83	51	15	180	50	87	24	1.00	3.56	123	9.3	5.2
138	9/27/83	51	16	180	44	93	2	1.00	3.27	123	9.0	5.0
139	9/27/83	51	27	178	47	328	19	1.00	2.96	251	8.2	3.2
140	9/27/63	51	31	178	37	120	21	1.00	4.11	231	7.6	4.7
141	9/27/83	51	34	178	21	87	24	1.00	2.55	221	7.5	4.2
142	9/28/83	51	36	178	22	120	2	0.80	3.14	231	7.5	
143	9/28/83	51	34	178	3	120	19	1.00	3.93	231	8.1	4.7
144	9/28/83	51	35	178	3	87	22	1.00	3.95	221	9.1	5.2
145	9/28/83	51	38	178	16	93	24	1.00	3 25	221	7.8	5.4
146	9/29/83	51	45	178	13	49	2	0.90	1.00	411	8.0	6.0
147	9/29/83	51	44	178	23	219	19	0.40	1.64	441	7.4	
148	9/29/83	51	45	178	14	87	22	0.70	2.25	421	7.2	5.2
149	9/29/83	51	43	178	19	87	24	1.00	3.50	421	6.9	5.7
150	9/30/83	51	39	178	16	126	2	1.00	4.14	431	7.3	4.3

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
151	9/30/83	51	41	178	35	312	19	1.00	3.03	451	7.4	3.4
152	9/30/83	51	39	178	30	93	21	1.00	2.86	421	6.9	5.7
153	9/30/83	51	38	178	23	120	23	1.00	3.14	431	6.7	4.0
154	10/ 1/83	51	40	178	56	328	19	1.00	3.36	451	6.6	
155	10/ 1/83	51	42	178	52	328	22	0.60	2.08	451	6.9	
156	10/ 2/83	52	10	175	42	87	19	1.00	3.61	422	7.2	5.2
157	10/ 2/83	52	10	175	45	126	21	0.40	1.73	432	7.3	4.7
158	10/ 2/83	52	9	175	43	66	23	1.00	3.73	422	7.5	5.3
159	10/ 3/83	52	7	175	33	44	1	1.00	3.33	412	7.6	
160	10/ 3/83	52	11	175	21	219	19	0.90	3.17	442	8.3	3.7
161	10/ 3/83	52	10	175	22	120	21	1.00	3.93	432	8.1	4.2
162	10/ 3/83	52	8	175	20	93	24	1.00	3.84	422	7.5	4.5
163	10/ 4/83	51	36	176	20	230	19	1.00	3.75	242	8.2	4.2
164	10/ 4/83	51	35	176	10	372	21	1.00	3.39	252	7.8	3.5
165	10/ 4/83	51	39	175	52	339	24	1.00	3.19	252	8.9	
166	10/ 5/83	51	42	175	32	252	2	1.00	2.94	242	8.0	3.8
167	10/ 5/83	51	46	174	53	339	19	1.00	3.17	252	7.9	3.8
168	10/ 5/83	51	51	174	44	120	22	1.00	3.42	232	7.5	
169	10/ 5/83	51	52	174	43	87	24	1.00	3.17	222	7.8	5.4
170	10/ 6/83	51	51	174	39	120	2	1.00	4.21	232	7.7	5.2
171	10/ 6/83	51	48	174	43	241	19	0.70	2.25	242	7.3	4.5
172	10/ 6/83	51	51	174	33	120	21	1.00	3.61	232	7.3	5.3
173	10/ 6/83	51	52	174	30	93	24	1.00	3.48	222	8.5	5.3
174	10/ 7/83	51	57	173	52	41	3	1.00	3.20	213	8.1	
175	10/ 7/83	51	51	173	56	317	19	1.00	2.82	253	9.4	3.9
176	10/ 7/83	51	51	173	59	219	22	1.00	3.31	243	9.6	4.2
177	10/ 7/83	51	52	173	60	126	24	1.00	3.19	233	9.5	4.9
178	10/ 8/83	51	53	173	57	93	3	1.00	3.39	223	9.1	5.3
179	10/ 8/83	51	59	171	59	120	19	0.90	3.79	233	9.1	4.9
180	10/ 8/83	51	60	171	54	93	21	1.00	3.13	222	8.6	5.2
181	10/ 8/83	52	12	171	46	252	24	0.60	2.06	243	7.9	4.2
182	10/ 9/83	52	11	171	36	339	2	0.90	2.96	253	8.1	3.6
183	10/ 9/83	52	21	170	47	120	19	1.00	3.64	233	7.8	5.1
184	10/ 9/83	52	20	170	47	93	22	1.00	3.98	223	7.7	5.2
185	10/ 9/83	52	28	170	33	202	24	1.00	3.85	243	7.4	3.3
186	10/10/83	52	23	170	30	326	2	0.80	2.76	253	7.9	3.5
187	10/10/83	53	50	167	18	137	19	1.00	2.47	732	7.9	4.9
188	10/10/83	53	50	167	18	191	22	1.00	2.69	742	7.8	
189	10/10/83	53	50	167	18	87	24	0.80	2.28	722	7.9	
190	10/11/83	53	49	167	19	82	4	1.00	3.32	722	7.6	6.7
191	10/11/83	53	41	167	20	49	19	1.00	3.35	712	7.8	7.3
192	10/11/83	53	40	167	20	44	21	1.00	3.33	712	7.9	6.8
193	10/11/83	53	51	167	20	328	24	0.90	2.63	752	7.9	3.6
194	10/12/83	53	49	167	18	155	1	0.00	0.10	632	0.0	
195	10/12/83	53	49	167	19	160	3	0.00	0.10	632	0.0	
196	10/12/83	53	48	167	17	160	5	0.00	0.10	632	0.0	
197	10/12/83	53	46	167	22	150	7	0.00	0.10	632	0.0	
198	10/16/83	54	47	183	41	328	19	1.00	3.12	551	6.9	3.5
199	10/16/83	54	49	183	29	355	22	1.00	3.10	551	7.1	3.2
200	10/17/83	54	48	181	35	328	19	1.00	2.98	551	7.4	3.3

HAUL	M/ D/YR	LATITUDE DEG MIN	LONGITUDE DEG MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
201	10/17/83	54 45	181 27	284	21	1.00	3.09	551	7.3	3.3
202	10/17/83	54 46	181 24	230	24	0.75	2.30	541	7.6	3.3
203	10/18/83	54 48	181 12	208	3	1.00	2.86	541	7.2	3.7
204	10/18/83	54 10	180 33	339	19	1.00	3.16	551	6.9	3.5
205	10/18/83	54 12	180 29	219	21	1.00	3.57	541	6.6	3.6
206	10/18/83	54 14	180 25	131	23	1.00	3.06	531	6.9	3.8
207	10/19/83	54 15	180 22	87	1	0.77	2.72	521	6.9	3.7
208	10/19/83	54 17	180 20	68	3	1.00	3.12	521	6.9	3.6
209	10/19/83	54 5	180 18	230	19	1.00	3.11	541	6.4	3.5
210	10/19/83	53 60	180 16	241	21	1.00	3.18	541	6.6	3.6
211	10/19/83	53 57	180 8	150	23	0.73	1.99	531	6.9	3.8
212	10/20/83	53 58	180 20	328	1	0.23	0.82	551	7.1	4.0
213	10/20/83	53 52	180 17	366	3	1.00	3.07	551	7.2	3.3
214	10/20/83	53 29	180 8	328	19	1.00	3.30	551	7.3	3.3
215	10/20/83	53 22	180 9	350	21	0.67	3.05	551	7.1	3.2
216	10/20/83	53 18	180 10	361	23	1.00	3.24	551	7.6	3.2
217	10/21/83	53 12	180 10	361	1	1.00	3.09	551	7.7	3.2
218	10/21/83	51 51	181 13	355	19	1.00	2.98	352	6.7	3.2
219	10/21/83	51 49	181 16	383	21	1.00	3.22	352	6.4	3.0
220	10/22/83	51 44	181 26	93	1	0.53	1.69	322	6.6	4.9
221	10/22/83	51 43	181 28	44	2	0.83	2.45	312	5.9	5.4
222	10/22/83	51 44	181 26	49	4	0.15	0.40	312	6.3	
223	10/22/83	52 1	181 20	388	19	1.00	2.55	352	6.1	3.2
224	10/22/83	52 6	181 27	328	22	1.00	3.02	352	6.6	3.5
225	10/23/83	52 5	181 39	284	1	1.00	3.13	352	6.6	3.5
226	10/23/83	52 4	181 42	219	2	1.00	3.08	342	6.2	3.7
227	10/23/83	51 53	181 40	87	19	1.00	3.32	322	6.5	5.0
228	10/23/83	51 54	181 43	82	21	0.23	0.40	322	5.9	
229	10/23/83	51 54	181 44	87	22	0.50	1.60	322	6.2	
230	10/23/83	51 54	191 43	82	23	0.33	1.20	322	6.3	
231	10/24/83	51 54	181 47	93	1	1.00	3.16	322	6.3	5.3
232	10/24/83	51 55	181 54	120	2	1.00	3.75	332	6.4	4.3
233	10/24/83	51 57	182 1	295	19	1.00	2.84	352	6.4	3.5
234	10/24/83	52 3	182 2	317	22	1.00	3.42	352	6.3	3.6
235	10/24/83	52 1	182 9	120	24	0.28	0.84	332	6.6	
236	10/25/83	51 59	182 6	202	2	0.75	2.10	342	6.4	4.6
237	10/25/83	52 7	182 10	87	4	1.00	2.69	322	7.1	5.0
238	10/25/83	52 16	183 50	87	20	1.00	2.13	321	7.0	4.7
239	10/26/83	52 12	183 47	49	20	1.00	2.05	311	6.7	4.3
240	10/26/83	52 17	183 51	120	22	1.00	2.47	331	7.7	6.7
241	10/27/83	52 13	183 56	66	1	0.12	0.40	321	6.6	
242	10/27/83	52 29	184 27	120	20	1.00	2.34	331	6.7	4.6
243	10/27/83	52 28	184 25	87	22	1.00	2.04	321	6.9	4.8
244	10/28/83	52 37	185 18	87	2	1.00	3.15	321	7.1	2.0
245	10/28/83	52 43	185 38	131	20	1.00	2.47	331	7.0	3.7
246	10/28/83	52 43	185 39	49	21	0.27	0.68	312	6.7	
247	10/29/83	52 51	186 13	98	3	1.00	2.78	321	6.9	3.7
248	10/29/83	52 51	186 24	49	5	1.00	2.13	311	6.8	5.5
249	10/29/83	53 1	186 42	120	20	1.00	3.21	331	6.7	4.0
250	10/29/83	53 5	187 2	66	22	0.82	3.00	321	6.9	3.9

HAUL	M/ D/YR	LATITUDE DEG	LATITUDE MIN	LONGITUDE DEG	LONGITUDE MIN	DEPTH (M)	TIME	DURATION (HR)	DISTANCE (NM)	STRATA	SURF. TEMP. (DEG C)	GEAR TEMP. (DEG C)
251	10/29/83	53	5	187	11	44	23	0.75	2.57	311	6.8	4.3
252	10/30/83	53	1	187	32	120	2	1.00	2.63	331	7.2	
253	10/30/83	52	60	187	52	219	4	1.00	3.41	341	7.3	3.6
254	10/30/83	53	1	188	19	301	19	1.00	2.92	351	6.6	3.5
255	10/30/83	53	7	188	15	246	22	1.00	2.65	341	6.7	3.5
256	10/30/83	53	3	188	36	306	24	0.73	1.78	351	6.7	3.4
257	10/31/83	53	2	188	55	142	3	1.00	2.82	331	6.7	4.0
258	10/31/83	53	3	188	55	71	16	0.38	1.24	321	6.4	3.8
259	10/31/83	53	11	189	16	301	19	0.95	2.67	351	5.7	3.4
260	10/31/83	53	17	189	24	208	22	1.00	3.27	341	6.1	3.7
261	10/31/83	53	14	189	18	120	23	0.86	3.02	331	6.3	3.8
262	11/ 1/83	53	15	189	12	93	1	1.00	2.28	321	6.2	3.9
263	11/ 1/83	53	22	189	27	328	4	1.00	2.67	351	6.5	3.2